Coal Age

MARCH, 1956

A McGRAW-HILL PUBLICATION—PRICE 50c

Continuous Mining

First production application of shortwall-type machine. p66

60-Yd Stripping Unit

Why and how Mountaineer was developed by Hanna. p70

Hydraulics

A 7-page troubleshooting guide for mechanics. p75

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BULGING EXPORTS...

Temporary or Permanent? p54

How M·S·A MinePhones boosted existing haulage efficiency to handle Powhatan's increased production

With new continuous mining machines and fast-moving shuttle cars funnelling coal to a seven-mile, single-track system from 12 faces, Powhatan Mining Company officials faced the fact that production would "out run" haulage unless a plan could be devised to make existing facilities adequate for the job.

They found the answer in M.S.A. MinePhones. Twelve of these units were installed in the Company's No. 3 mine and another twelve at the No. 1 mine, near Bellaire, Ohio. The new system gives the dispatcher instant, continuous, two-way voice communication contact with locomotive motormen, the underground maintenance shop, and a "jeep" which carries men, and acts as an emergency vehicle. Now, haulage decisions are made quickly, keeping trips moving, minimizing "waits" on sidings. Repair needs are relayed "on the double," over-all safety has improved.

We will be happy to discuss your haulage system, and show you how M.S.A. MinePhones can aid efficiency, increase safety. Write for complete details.

MinePhone-equipped "jeep" carries fire extinguishers, first aid, Chemox breathing apparatus

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TVA's Shawnee Steam Plant

How to burn 600 tons of coal in one hour

A typical example of B. F. Goodrich improvement in rubber

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Call your B. F. Goodrich distributor for more information about any kind of belting—or hose or other B. F. Goodrich rubber products. *The B. F. Goodrich Co., Dept. M-591, Akron 18, O.*

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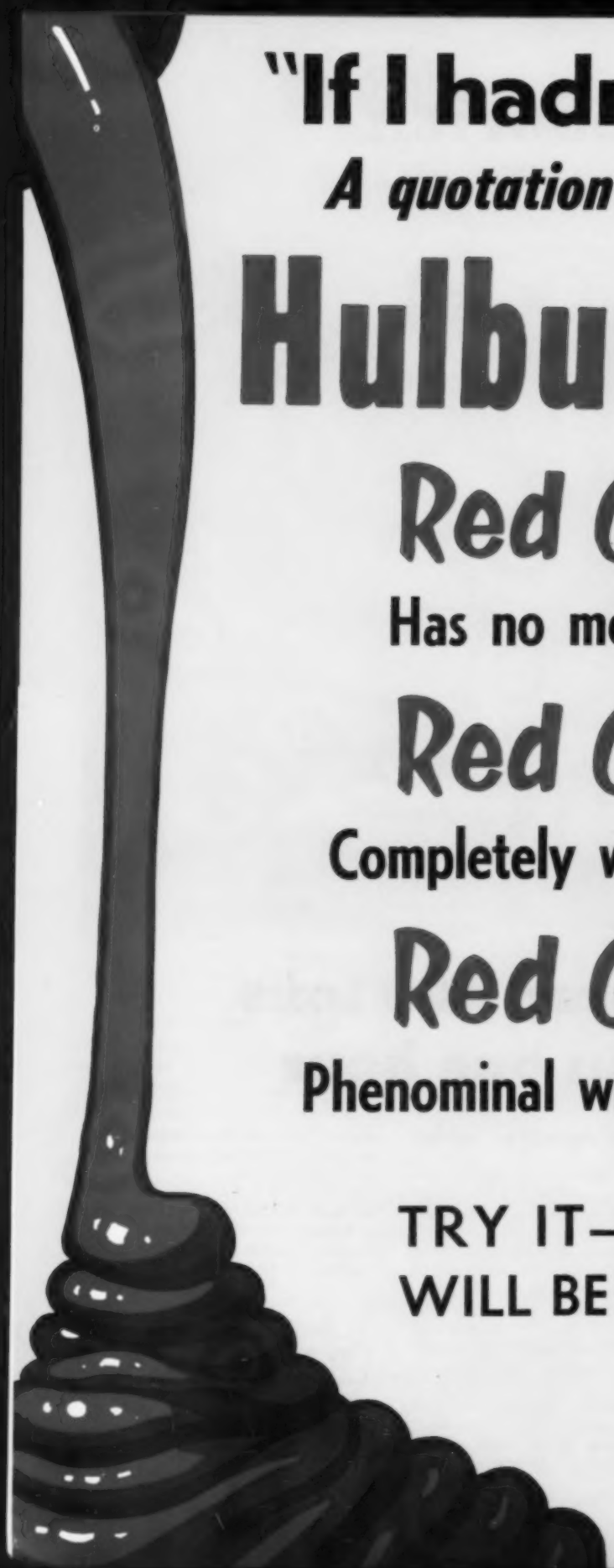
INDUSTRIAL PRODUCTS DIVISION



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TRY IT—YOU, TOO,
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These facts have been established *in the field*. Bird presents them without prejudice because Bird builds both vacuum filters and centrifugal filters. May we tell you the whole story?

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BIRD COAL FILTERS

Coal Age

MARCH • 1956

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In this issue . . .

• Master mechanics and all other maintenance supervisors will find a valuable store of information for direct on-the-job application in the article on hydraulics beginning on p 75. Production supervisors in mechanized mines also will find the information of great value in helping to head off mechanical breakdowns resulting from outages in hydraulic systems. You may wish to show it to your machine operators and mine mechanics.

• You will find also (p 70) a report on the 60-yd stripping shovel recently placed in service by Hanna Coal Co., telling why the shovel was built, what it is designed to do and how new techniques were used in its design and construction.

• Beginning on p 66 is the story of the first production application of the Wilcox mining machine at C. H. Mead Coal Co., written by Richard H. Mason, coal editor, Beckley Post-Herald, Beckley, W. Va.

Coming in April

Keystone's annual listing of the 50 biggest mines in the nation. See how your mine stacks up against the annual production tonnages of these.

On Our Cover:

Theme of our cover this month is the growth of America's participation in the world's markets for coal. Total exports in 1955 were more than double the 1954 volume, and increasing activity in this market is seen in the years ahead. The assembled facts in the 12-page article on exports, beginning on p 54, are the results of an extensive *Coal Age* survey through the facilities of McGraw-Hill World News.

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COAL AGE — MARCH, 1956
VOLUME 61 — NUMBER 3

(with which are combined The Colliery Engineer and Mines and Minerals)

Published monthly on the 1st, with an additional issue in Mid-July by McGraw-Hill Publishing Company, Inc.; James H. McGraw (1860-1948), Founder. Member ABC and ABP.

Executive, Editorial and Advertising Offices: McGraw-Hill Building, 330 W. 42nd St., New York 36, N. Y. Publication Office, 1309 Noble St., Philadelphia 23, Pa. Donald C. McGraw, President; Paul Montgomery, Executive Vice President; Joseph A. Gerardi, Vice President and Treasurer; John J. Cooke, secretary; Nelson Bond, Executive Vice President, Publications Division; Ralph B. Smith, Vice President and Editorial Director; Joseph H. Allen, Vice President and Director of Advertising Sales; J. E. Blackburn Jr., Vice President and Circulation Director.

Subscription: Address all correspondence to COAL AGE — Subscription Service, 330 W. 42nd St., New York 36, N. Y.

A McGRAW-HILL PUBLICATION

Member of Associated Business Publications and Audit Bureau of Circulations

Allow 1 month for change of address. Subscriptions are solicited only from management, production and maintenance executives and engineers in the coal mining industry. Position and company connection must be indicated on subscription orders.

Single Copies: U. S. and possessions and Canada: 50c; all other countries, $1.50.

Subscription rates: United States and possessions and Canada, $3 for one year, $4 for two years, $5 for three years.

Other Western Hemisphere and the Philippines, $10 for one year, $16 for two years, $20 for three years. All other countries, $15 for one year, $25 for two years, $30 for three years.

Entered as second class matter May 4, 1951, at the Post Office, Philadelphia, Pa., under the Act of March 3, 1879. Printed in U.S.A.

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COAL AGE articles are indexed regularly by Engineering Index, Inc. **COAL AGE's** own Index is published annually in December.

Branch Offices and District Managers: Atlanta 3, W. H. Kearns, Jr.; Chicago 11, F. W. Roets and G. A. Mack; Cleveland 15, J. E. Lange; Dallas 1, G. L. Jones, Jr.; Los Angeles 17, W. C. Woolston; New York 36, H. C. Chellson, J. W. Patten (New Eng.); Philadelphia 3, J. B. Lewis; Pittsburgh 22, W. H. H. Ginder; St. Louis 1, F. W. Roets; San Francisco 4, J. W. Otterson; Washington 4; London E.C. 4, McGraw-Hill House, 95 Farrington St., H. Lagler.

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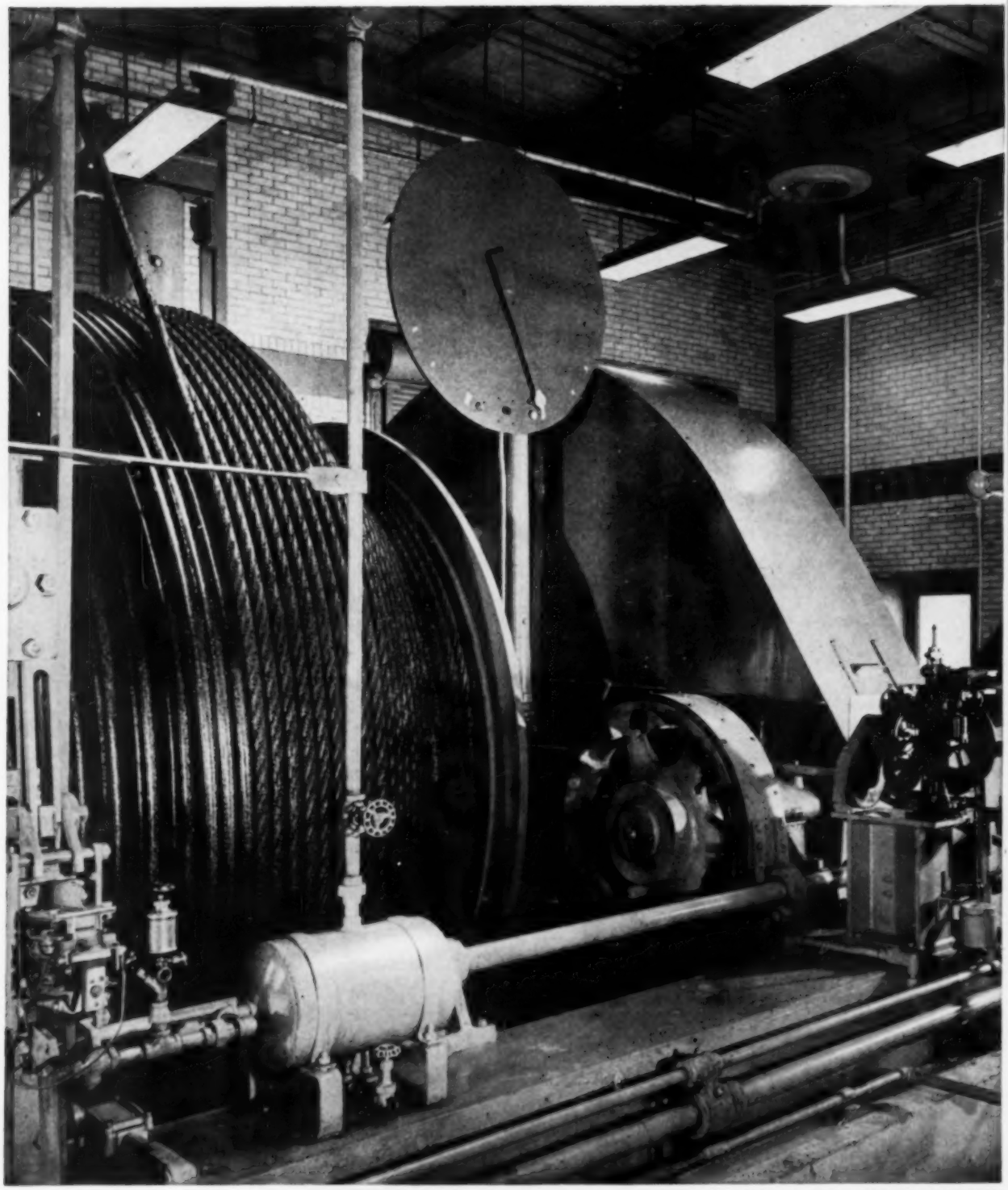

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Dumptor hauls along trestles .

. . or tunnels

. . without turning

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K446

On trackless mining operation, Koehring 6-yard Dumptor goes underground . . . shuttles in and out of access tunnel without turning. This heavy-duty hauler has over 6 h.p. per ton of loaded weight, climbs 24% ramps, grades.

Dumptor puts stockpiling on a fast, shuttle-haul basis. It drives up to edge of pile, body forward . . . dumps, and heads back for next load without turning. Instant gravity-dump action kicks the load out over edge of the bank . . . saves a lot of dozer clean-up on the stockpile.

Big square body opening permits loading over either end or sides. Dumptor above is teamed with Koehring 1½-yard 605 shovel . . . a big-production combination. Other Koehring excavators: ½ to 2½ yards . . . cranes up to 79½ tons.

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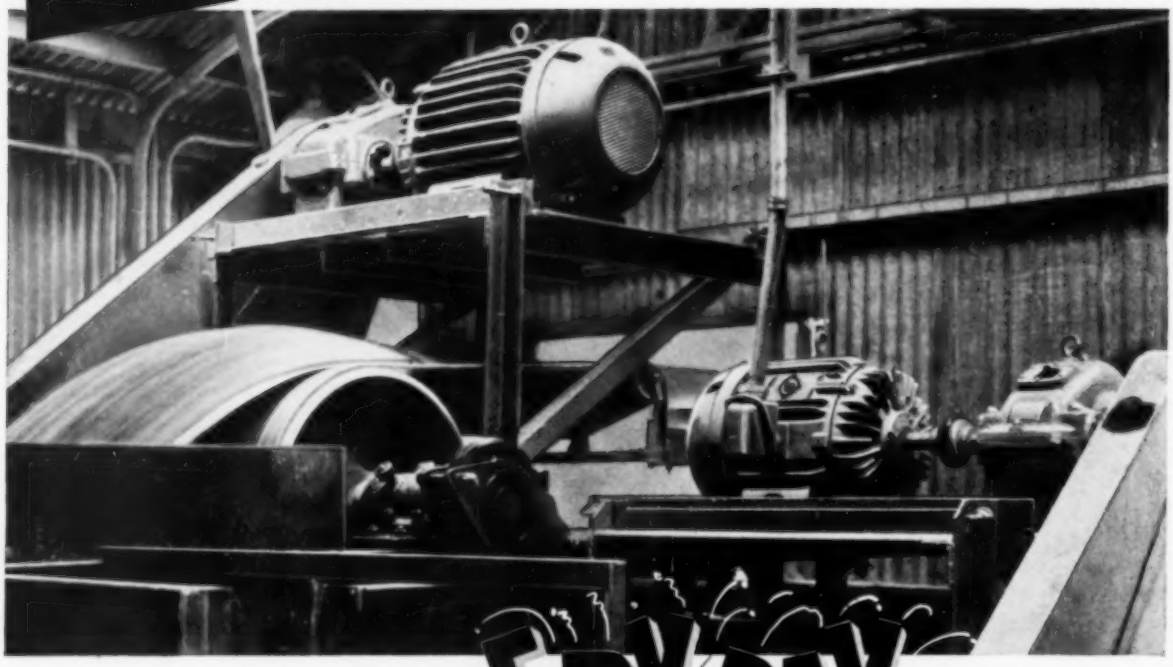

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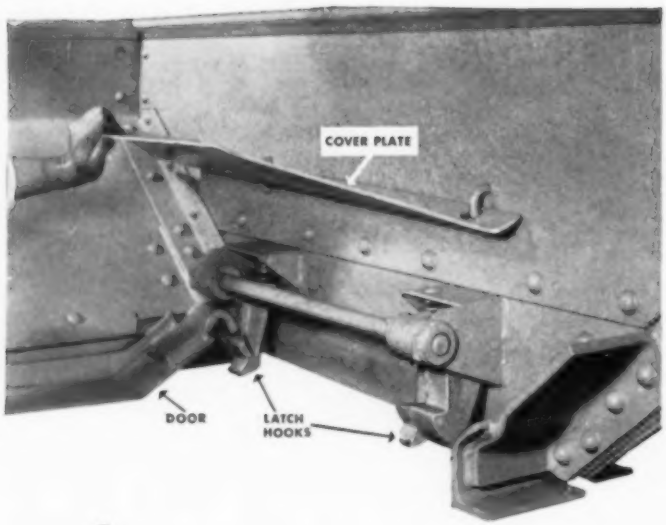


Only S-D Automatics give you these advantages

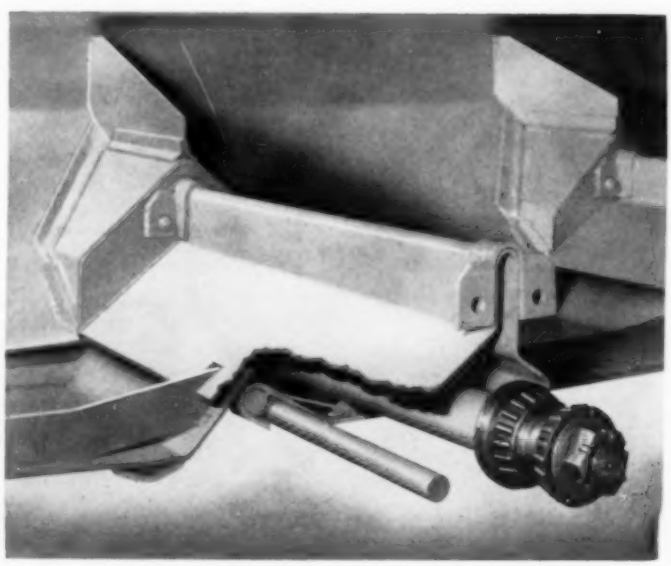
1 TWO LATCHES FOR SAFE AND SURE LATCHING! They are tripped simultaneously underneath car for automatic dumping. With S-D "Twin Safety Latches" your bottom dumping car doors are actually padlocked twice. These latches (see photo above) are tripped independently by a pair of tripping devices mounted between the rails. (Note the tripping devices shown in bin photo on opposite page.) Both latches must be tripped simultaneously before the doors open. This eliminates doors opening accidentally anywhere along the haulage route.

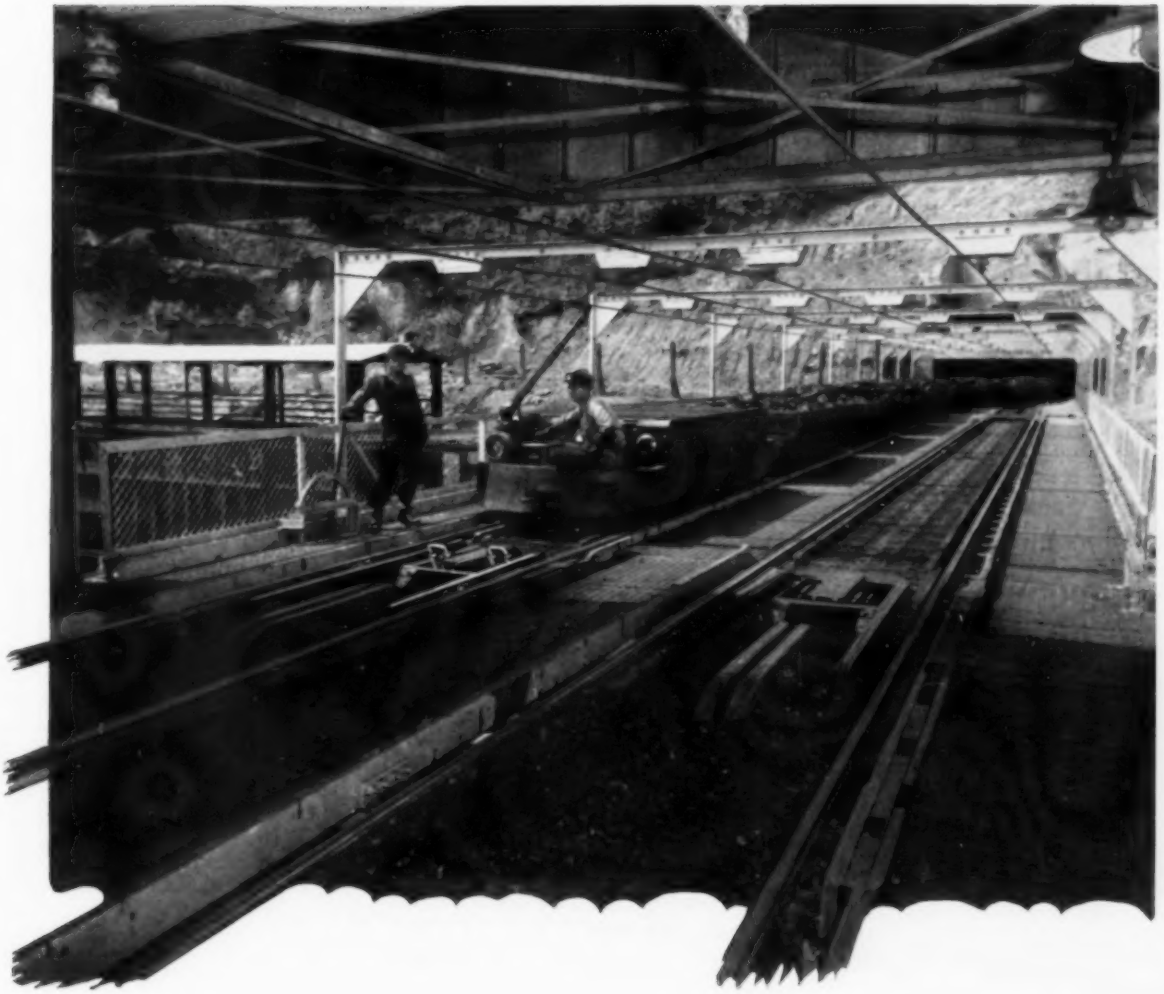
1 "Twin Safety Latches" for safe and sure latching

2 Safety Sealed against dust leakage

3 ¼ to ½ ton more capacity per car for the same overall dimensions

2 SEALED AGAINST DUST LEAKAGE! Sanford-Day's exclusive bottom dumping car seal means two extra values: (1) Sealed S-D Automatics give you a new, safer in-the-mine operation by eliminating leakage of dust. (2) Sealed S-D Automatics enable you to make a tremendous reduction in track clean-up costs. Cross-sectional view at right points out how the flares extend over doors when closed, sealing material in car.





3 ONE-QUARTER TO ½ TON MORE CAPACITY PER CAR FOR THE SAME OVERALL DIMENSIONS is available only in S-D Automatics because of the construction features of Sanford-Day's exclusive bottom dumping car design. If you were buying, for example, 16 bottom dumping cars of any other make with a 4-ton level full capacity, you would need only 14 S-D Automatics of the same overall dimensions to haul the same tonnage. You would save two cars in every 16 . . . 12½ percent in original investment . . . 12½ percent in maintenance . . . 12½ percent less dead weight to haul. Any one of our sales engineers will demonstrate to your complete satisfaction just how we are able to give you this extra capacity.

THESE THREE fundamental and necessary advantages are offered only by S-D Automatics! They mean that only S-D Automatics can haul coal out of your mine at the lowest possible cost! Assure yourself of the maximum economies bottom dumping cars offer you by buying S-D Automatics! For complete information, write or call us today. Sanford-Day Iron Works, Inc., P. O. Box 1511 . . . Telephone 3-4191, Knoxville, Tenn.

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Wide-base tubeless tires and windshield, shown, available as optional equipment.

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2 **Straight-Line Ejector Reeving** requires minimum power; leaves more power on Payscraper wheels for faster dumping and spreading. Also speeds re-threading time.

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8 **Larger, Wider Fenders** give greater safety for operator, greater protection for machine.

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Put the 1956 International Payscraper to work on your job, and watch dirt boil up into its new, straight-back bowl. You've never seen any big scraper load as easily or as fast. In seconds, you've packed in up to 23 heaped yards. Its offset 3-section blade breaks the ground like a sharp-pointed spade. Dirt boils from the smooth-slicing cutting edge and fills the corners to build a full heaped load. Close the apron instantly, positively, on this huge, well-compacted load and you carry all the dirt you've heaped in.

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from right to left takes the stress and strain out of hauls over furrows, rough ground.

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46" FEED

64" FEED

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Remove Chuck

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All models available in either SAV-A-CHANGE or Socket Type Chuck

● The new CLEVELAND S20 VAC-NU-MATIC dust collecting stoper is available in 3 feed lengths to suit any working height down to a 26" seam. *It will produce a 30" hole in a 26" seam without using coupled steel.* The 28" feed weighs 69 lbs. complete. Any model may be used either hand held or jumbo mounted. VAC-NU-MATIC bits are fast and free cutting and eliminate all stuck steels. Dust collection is positive even in wet top. Chucks may be replaced without dismantling the machine, using only a pair of snap-ring pliers. Cuttings are removed at the chuck housing and do not pass through the machine. Write for bulletin RD32 or let us demonstrate in your own mine.

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Abolish "Waiting Around" Cable

Storing power cable like this is costly and unnecessary. The new power centers will help you eliminate such scenes. Thus you reduce the amount of cable in service and also keep it in better condition.

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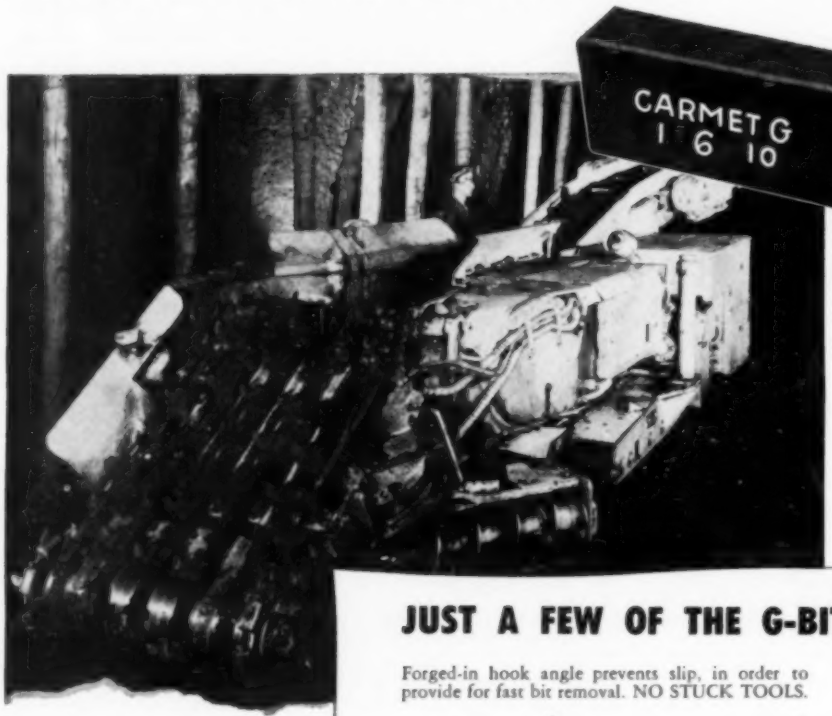
NEW CARMET "G" SERIES

CARBIDE BITS for CONTINUOUS MINING MACHINES



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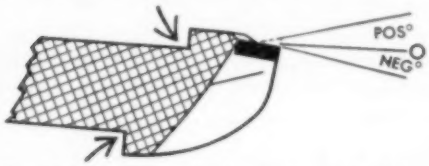
Forged-in hook angle prevents slip, in order to provide for fast bit removal. NO STUCK TOOLS.



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● Let them show you the Carmet way to lower tool cost and increased production. *Allegheny Ludlum Steel Corporation, Carmet Division, 1500 Jarvis Avenue, Detroit 20, Michigan.*

The Original DOUBLE-BONDED Carbide Bit

CARMET® AL

WAD 5551 B

Patented and Patents Pending 21238

740 TONS PER SHIFT...

with one Goodman Continuous Borer serviced by 2 shuttle cars

Room and Pillar Work	One Month
Tons produced	19,992.6
Shifts worked	27
Average tons per shift	740.46
Crew, including roof bolters, mechanic and foreman	8
Average tons per man per shift	92.55

This same machine averaged 724.97 tons per shift in room and pillar work for a 6 month period. With an 8 man crew, tons per man per shift averaged 90.62.

These production figures apply to a large operation mining a seam containing normal amounts of pyrite and clay intrusions. Coal height is 8 feet, mining height is 7 feet, top coal being left as support. The bottom is firm fireclay with a tendency to heave during pillar extraction. Shuttle cars take coal from Continuous Borer to mine cars for haulage to shaft for hoisting.

All the power, ruggedness and mobility needed for full production work and development work are built into the Goodman Continuous Borer. It has raised efficiency at the working face to a new high level—at this installation and others; and has the capacity to increase its efficiency as it spends more hours-per-shift in actual operation.

See the Goodman Continuous Borer in action before you decide

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SHUTTLE CARS • LOCOMOTIVES • CONTINUOUS MINERS

Use Genuine Goodman Replacement Parts

Trackwork with a capital T

Notice the big heavy rail on this fine West Virginia haulway, rail fully capable of handling heavy tonnage at high speed. And you can hardly help admiring that slick double crossover, with its perfect alignment and precision components.

This is the way mine track looks when it has the Bethlehem touch. It stems from the thorough knowledge and experience of Bethlehem engineers, and the careful study they give to every trackwork problem. It stems from rails accurately pre-cut to length, and curves pre-formed to proper radii. Frogs, switch points and other components are always pre-assembled at Bethlehem's plant to make dead-sure they'll fit perfectly at the site.

That's the way to get trackwork with a capital T. Yet from a cost standpoint there's nothing "plushy" about a Bethlehem layout. Many mines are finding that a Bethlehem job actually pays for itself in surprisingly short order.

If your trackwork falls short of your needs, perhaps the time is right for a chat with Bethlehem. One of our engineers will be glad to sit down with you, listen to your problem and work out the answer with you. Just name the time and the place.

BETHLEHEM STEEL COMPANY, BETHLEHEM, PA.

On the Pacific Coast Bethlehem products are sold by Bethlehem Pacific Coast Steel Corporation. *Export Distributor:* Bethlehem Steel Export Corporation

BETHLEHEM STEEL

BETHLEHEM STEEL

AEROFLOC® Reagents

Efficient and Easy to Use

to flocculate wash-water fines
to settle solids quickly
to assure a clear plant-effluent and thereby minimize stream-pollution problems

UNFLOCCULATED SLIMES

AFTER ADDING AEROFLOC REAGENTS

Perhaps you've already heard how effectively AEROFLOC Reagents speed up and improve complete settling of wash-water fines and reduce solids in plant effluent.

Perhaps you've already seen data on how incredibly fast AEROFLOC Reagents agglomerate wash-water fines into relatively massive, fast-settling flocs.

But did you know that AEROFLOC Reagents

- Are effective at very low concentrations—as little as 1 pound per hour drip fed as a ½% solution has successfully treated a flow of 10,000 gallons per minute.
- Are water soluble with simple agitation, requiring a minimum of labor for mixing and feeding.
- Require no elaborate feeding equipment.
- Can be added wherever plant tests show best results.

Three AEROFLOC Reagents—#548, 552 and 3000—are now available. You should test all three to determine which is most efficient at your breaker. We'll be glad to provide samples for tests and the services of a Cyanamid Field Engineer to work with you. The handy coupon is for you convenience.

AMERICAN CYANAMID COMPANY
MINERAL DRESSING DEPARTMENT
30 ROCKEFELLER PLAZA, NEW YORK 20, NEW YORK

CYANAMID

Please send me samples and data on AEROFLOC Reagents.

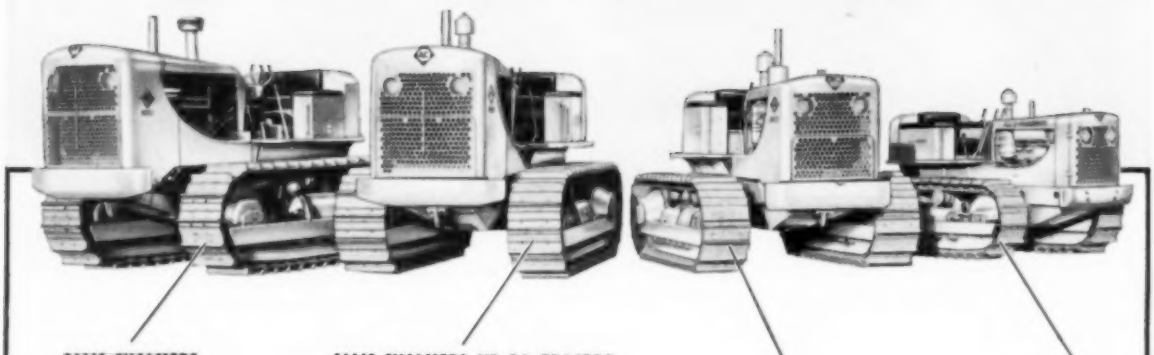
NAME_____

TITLE_____

COMPANY_____

ADDRESS_____

More features you want for high production . . . long life . . . low job costs



ALLIS-CHALMERS HD-21 TORQUE CONVERTER TRACTOR
Hp — 204 net engine
Weight — 44,000 lb
Drawbar pull — up to 65,000 lb

ALLIS-CHALMERS HD-16 TRACTOR

Standard Transmission	Torque Converter Drive
Hp — 141 belt	Hp — 150 net engine
Weight — 31,500 lb	Weight — 31,600 lb
Drawbar pull — up to 37,700 lb	Drawbar pull — up to 60,000 lb

ALLIS-CHALMERS HD-11 TRACTOR
Hp — 85 belt
Weight — 20,500 lb
Drawbar pull — up to 21,980 lb

ALLIS-CHALMERS HD-6 TRACTOR
Hp — 55 belt
Weight — 12,400 lb
Drawbar pull — up to 12,650 lb

HERE IT IS . . . the all-new Allis-Chalmers line of crawler tractors . . . with more of everything you've wanted most for steady output—more work power, more long-life features, more easy maintenance and easy operation features, more versatility in every tractor.

You get all the benefits of Allis-Chalmers advanced basic design with the new Allis-Chalmers diesel engine . . . proved torque converter drive for the HD-21 and HD-16 . . . all-steel box-A main frame . . . unit construction . . . 1,000-hour lubrication intervals for truck wheels, idlers, support rollers . . . double-reduction final drives, and many other profit-producing features.

And there's a complete spread of tractor equipment — hydraulic and cable dozers, heavy-duty winches, hydraulic rippers. You can choose from a full line of tractor shovels ranging from 1½-yd to 4-yd capacity.

Behind this equipment are dealers with sales and service personnel and facilities that assure you expert "after sales" care. The True Original Parts they stock help give you continued top performance and long equipment life.

Your Allis-Chalmers dealer will show you how these feature-packed crawlers can do your jobs better and at lower cost. See him for full details.

ALLIS-CHALMERS, CONSTRUCTION MACHINERY DIVISION,
MILWAUKEE 1, WISCONSIN

ALLIS-CHALMERS

TOPS IN TEAM WORK—ALL THREE

each does a special job

J&L's JALTEN series offers you three top performing high strength, low alloy steels with the following characteristics:

JALTEN NO. 1—High strength, good formability and fabricating—good resistance to low temperature impact.

JALTEN NO. 2—High strength, moderate forming—improved resistance to atmospheric corrosion.

JALTEN NO. 3—High strength—improved abrasion resistance.

J&L STEEL

SEND FOR THIS NEW BOOK:

Chemical properties of Jalten
Mechanical properties of Jalten
Jalten equivalents
Jalten application data

Jones & Laughlin Steel Corporation
Dept. 411—3 Gateway Center
Pittsburgh 30, Pennsylvania

Please send a copy of your Jalten booklet, *JALTEN LOW-ALLOY, HIGH-STRENGTH STEEL.*

NAME_____

TITLE_____

COMPANY_____

ADDRESS_____

CITY_____ ZONE_____ STATE_____

Jones & Laughlin
STEEL CORPORATION — *Pittsburgh*

Why buy a truck in the dark?

"Oh, kick me!" cries Merchant Neal,
In a posture hardly genteel.
He bought trucks in haste,
Then the costly fact faced,
That he'd missed the Dodge Dealer's Deal!

If you buy a new truck after looking at only one make, it's like making a deal in the dark. A smarter way to buy is to "*spotlight*" *real truck* value—weigh and compare competitive claims with these Dodge truck facts:

Most standard V-8 horsepower of all leading makes—½-ton through 3½-ton range. You'll make faster trips—get more work done!

Shortest turning radius. You'll maneuver in traffic, and park more easily.

Biggest cabs, with biggest wrap-around windshield. You'll enjoy more comfort, safer vision.

Highest payload capacities . . . pick-ups providing up to 22% more payload than others.

Prices down with the lowest.

Next truck you buy, don't deal in the dark. Turn a bright light on the facts. See Dodge before you buy.

GET THE DODGE DEALER'S DEAL BEFORE YOU DECIDE

DODGE
Job-Rated
TRUCKS
WITH THE *FORWARD* LOOK

"ON THE JOB DAY-IN AND DAY-OUT"

GM DETROIT DIESEL CASE HISTORY No. IC9-121

OWNER: The Maumee Collieries Co., Jasonville, Indiana.

INSTALLATION: GM Detroit Diesel "Twin 6-71" replaced another make Diesel in 5-yard 5W Monaghan in 1948. Company now owns 24 GM Detroit Diesel-powered shovels, tractors, graders and a truck.

PERFORMANCE: Company specifies GM Detroit Diesel power "to get day-in, day-out operation with minimum attention." They report, "Our GM Detroit Diesels have given us excellent service." GM Detroit "Twin 6-71" Diesel in Monaghan has run more than 25,000 hours with only one overhaul.

THE STORY of the Maumee Collieries is duplicated thousands of times.

A customer gets his first General Motors Detroit Diesel. And it quickly establishes a fast-working, cost-cutting reputation.

Then he buys another—and another—until soon he's standardized on GM Detroit Diesel power.

For a GM Detroit Diesel is packed with real snap that makes the job go faster—sets the pace for your whole operation. And after you see what this Diesel can do, you'll be satisfied with no other Diesel.

The reasons are simple. Two-cycle operation. Easy maintenance. Simple repairs. Low-cost, interchangeable parts and fast service everywhere.

These are just a few reasons why it's *America's first choice Diesel*. Your local GM Detroit Diesel distributor can tell you the full story or write direct.

JIMMY DIESEL'S MAINTENANCE TIPS

Got Spring Fever? Maybe your engines have, too. Your GM Detroit Diesel distributor or dealer can snap 'em out of it with a spring tune-up. And he'll help you set up a preventive maintenance program to keep your engines running right all summer long. Take care of your engines and they'll take care of you and remember—Preventive Maintenance Doesn't Cost—It Pays.

DETROIT DIESEL

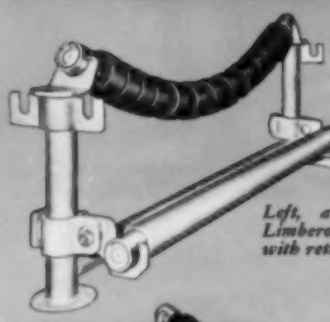
Engine Division
of General Motors
Detroit 28, Michigan

Single Engines . . . 30 to 300 H.P. Multiple Units . . . Up to 893 H.P.

America's Largest Builder of Diesel Engines

Above, a view of the belt in operation. Note how true the idlers train and run.

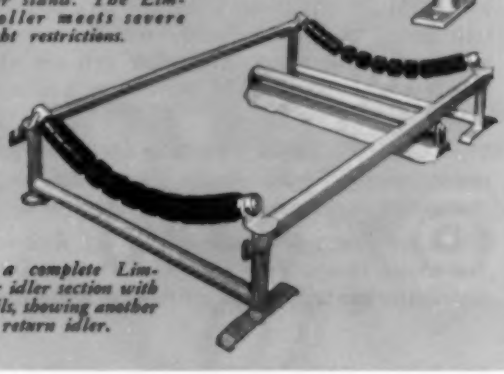
About 100 ft. of the conveyor sections leading to the drive are installed overhead, held by roof bolts, to clear and discharge into mine cars.



Left, a standard-height Limberoller idler stand, with return idler in place.

This Limberoller-equipped belt conveyor is powered by a Joy MTB-36 drive (100 HP, 550 volts DC). Standing by the drive unit is the mine's general superintendent, who supervised the conveyor installation.

Right, a low-height impact idler stand. The Limberoller meets severe height restrictions.



Right, a complete Limberoller idler section with side rails, showing another type of return idler.

This Unique Joy
LIMBEROLLER-EQUIPPED
BELT CONVEYOR

is saving money many ways!

operator says: *"Well pleased"*

This 36″ wide, 3000 ft. long Joy Belt Conveyor (illustrated on the left-hand page) is installed in a Virginia mine operating in the Norton seam. The coal averages 42″ high.

The new 36″ belt is completely equipped with Limberoller idlers. It takes the discharge from *three* 26″ belts and handles the coal to the discharge end with no spillage, and therefore eliminates clean-up men.

Limberoller idlers are an exclusive Joy development ...and the best news for hard, dirty, continuous underground service in many a year. Each idler consists of a series of neoprene discs molded in one piece on a core of flexible steel cable, and there are only two self-lubricated bearings per idler—*one at each end, up out of the dirt.*

Thousands of Limberollers are in highly successful use today. At this mine, the officials say they're well pleased, both with no spillage and with the open construction of section frames that permits easy inspection. Since starting up the belt in early Autumn, 1955, they've had no trouble, no failures, no maintenance. Production rates are improved, and they expect at least 20% longer belt life, due to the fact of better troughing and reduced shock on the belt by the Limberollers.

There's just one best answer to belt conveyor problems—and that's the Joy Limberoller idler. ● Let us work with *you.* ***Joy Manufacturing Company, Oliver Building, Pittsburgh 22, Penna.*** In Canada: *Joy Manufacturing Company (Canada) Limited, Galt, Ontario.*

Write for FREE Bulletin 72-1

Consult a Joy Engineer

WSW 6029-72

NO OTHER CONVEYOR IDLER MATCHES THESE ADVANTAGES OF THE

JOY LIMBEROLLER

- ★ Follows mine bottom, withstands greater misalignment.
- ★ No spillage, centers the load and shapes to it.
- ★ Easy to extend or retract—to handle, store and haul.
- ★ Less time and easier to set up, knock down and move.
- ★ No lubrication needed, no bolts or cover sheets required.
- ★ Fewer idlers required: spaced at least 50% further apart.
- ★ All components can be transported on the belt.
- ★ No worry over which end of conveyor sections goes in first.
- ★ Less friction to start up, only 1/3 as many bearings.
- ★ Only 1/3 as heavy as steel idlers, easy to change.
- ★ Ideal for hard-to-get-at locations—put it in and forget it.
- ★ Less belt wear, longer life.

JOY

WORLD'S LARGEST MANUFACTURER OF UNDERGROUND MINING EQUIPMENT

STOP VARNISH!

Refill now with Sinclair SUPER TENOL® Motor Oil for top protection against harmful varnish in your Diesel engines.

No matter how rushed the job, SUPER TENOL protects your engine against the effects of high temperature, over-loading and *continuous stop-and-go*. Your Diesel stays on-the-job longer, with less wear . . . fewer repairs.

You get these benefits from Sinclair SUPER TENOL because it's specially made for *severe duty*. High viscosity index base oils, plus a heavy concentration of selected additives, have been combined to give you maximum protection against varnish, sludge, rust, and acid corrosion.

Refill now with Sinclair SUPER TENOL. Contact your local Sinclair Representative for further information or write Sinclair Refining Company, Technical Service Division, 600 Fifth Avenue, New York 20, N. Y. *There's no obligation*

SINCLAIR SUPER TENOL

New "B" Rear-Dump offers you big capacity PLUS

High speed

B Tournapull Rear-Dump has forward speeds from 2 to 34 mph, plus two reverse speeds, 2 and 4 mph. Wide selection of speeds enable "B" to climb steep grades.

Easy loading

Loading of new "B" is made easier by large "target" area of bowl. Its 17'8" length, 10'2" width, and 7'6" depth make it ideal for any size shovel. Rear of body provides wide, low entry for dipper to give extra speed advantage for the excavator. Big 35-ton capacity can make every load a profitable one.

Fast dumping

At the touch of a dashboard switch, body raises to vertical position. Edge of bowl swings behind and below rear wheels so rocks cannot roll forward to lodge against wheels nor can material pile under rear end.

180° turn in 35' space

Two wheel prime-mover turns 90° right or left . . . machine in normal use makes non-stop 180° turn in space only 35' wide. With body in dump position, machine can turn 180° in only 27'. This maneuverability of "B" allows you to work in tight quarters where smaller conventional haulers often cannot go. Jockeying back and forth to get into loading position is eliminated.

7536 square inches of braking surface

Heavy-duty air brakes with 7536 sq. in. of braking surface improve maneuverability . . . add to operator confidence for faster operation on steep grades and narrow winding haul roads.

New "B" also offers these additional features

- Big 7-ft. high 2-ft. wide low pressure tires for better flotation.
- Rugged body construction for longer equipment life.
- Simple, positive electric controls for fast, easy operating.
- Lower maintenance because there are no hydraulics, no long driveshafts, no springs or spring hangers.

For more information on this big new "B" Rear-Dump see your Le-Tourneau-Westinghouse Distributor.

Tournapull — Trademark Reg. U. S. Pat. Off. BR-888-G-b

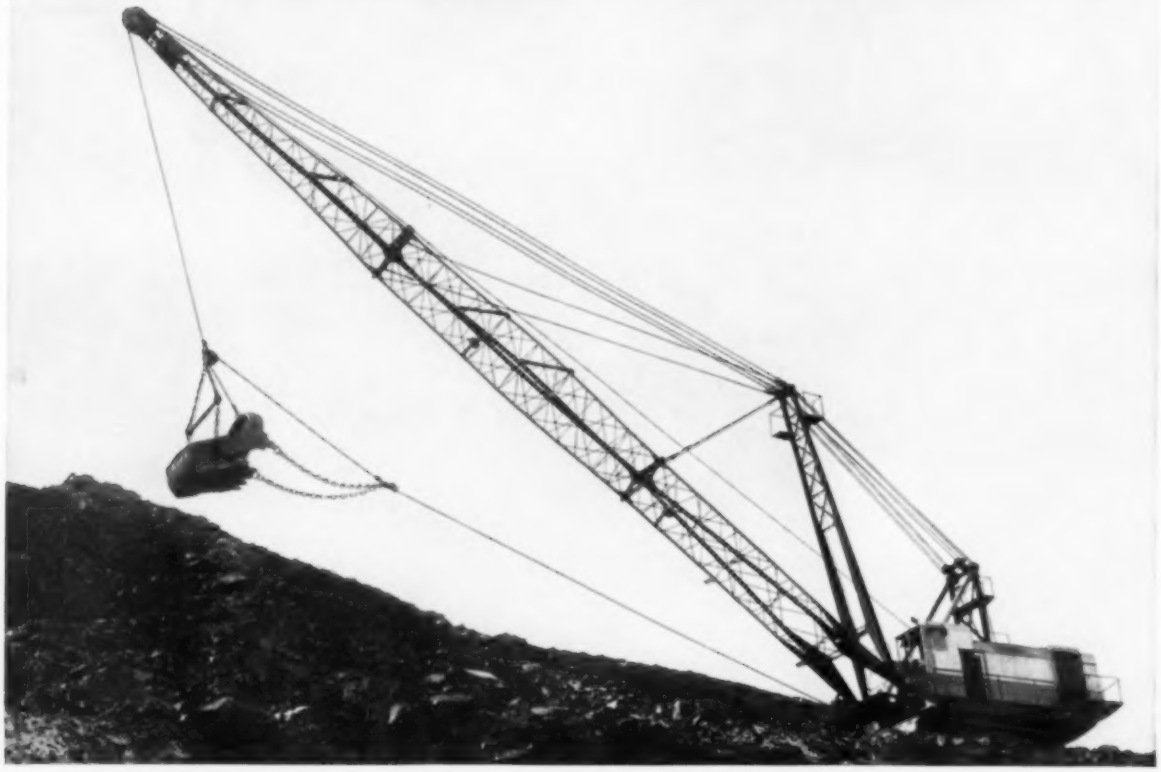
LeTourneau-WESTINGHOUSE Company

Peoria, Illinois

A Subsidiary of Westinghouse Air Brake Company

an ACCO product

American Cable TRU-LAY VHS | 15% STRONGER



57% Longer Life with New VHS Dragline

Draglines take a real beating in the coal stripping operations of the C B & M Coal Company, Plains, Pennsylvania. Used for removing over-burden, the best Improved Plow Steel draglines lasted 525 hours. When new TRU-LAY VHS draglines were used they established service records of 825 hours—57% better than Improved Plow Steel.

Entirely New Grade

Mines all over the country are setting similar service records with new VHS. Made from a new grade of steel for wire rope—New VHS is at least 15% stronger than Improved Plow Steel, the strongest grade available before VHS. This means you can handle heavier loads with the same diameter line. And you get a higher factor of safety.

For Slusher Ropes, Shovel Hoist Ropes, Draglines

New VHS is also tougher . . . resists abrasion . . . cannot become "hide-bound" or lose its flexibility. Developed especially for use as slusher ropes, draglines and shovel hoist ropes, it stands up better in these toughest services.

Cuts "Down Time"—Saves Money

In addition to longer life, new VHS cuts costly "down time" of equipment for wire rope replacement. This can mean real savings.

At Your Distributor Now

Your American Cable distributor has draglines, slusher ropes and shovel hoist ropes of new VHS in stock now. Just call him and tell him the size and length you want. You don't need any complicated specifications.

See your American Cable Distributor or write to the nearest American Chain & Cable Company Office

ACCO American Cable Division

AMERICAN CHAIN & CABLE

Wilkes-Barre, Pa., Atlanta, Chicago, Denver, Houston, Los Angeles, New York, Odessa, Tex., Philadelphia, Pittsburgh, Portland, Ore., San Francisco, Bridgeport, Conn.

Speed and Mobility

get more work done!

Tournatractor takes the shortest route to job . . . via highway or cross country . . . cuts hours from job-to-job moves.

208 hp Tournatractor with PCU on rear can be hooked up to pull scrapers, rooters, and rollers.

Rubber tires do not damage rails or ties... unit can switch up to 10 fully-loaded railroad cars at once.

Whenever your application involves scattered job assignments, Tournatractor's 19 mph forward speed and extreme maneuverability cuts moving costs and reduces the non-pay hours of moving time. Big, low-pressure tires let you drive Tournatractor anywhere. For long moves, you save time, bother, and expense of locating a trailer, moving in extra manpower and transport equipment, loading and unloading.

Speed on the job

Tournatractor pulls, dozes, pushes at working speeds 2 to 3 times faster than crawler tractors. You have 3.69 mph in second gear, 8.38 mph in third, compared to crawler speeds of around 2 mph in second, and 3 mph in third. Tournatractor travel speed of 19.23 mph compares to the crawlers' top ranges of 4 to 6 mph. You change gears instantly . . . waste no time shifting.

8 mph reverse speed

High reverse speeds give a very important time-saving advantage to tractor-on-rubber. Nearly 50% of your working cycle on dozing or pushing jobs is usually spent backing up. Tournatractor's reverse speed cuts crawler backing up time by almost 25 to 50%. Crawler highs in reverse range from 3.1 to 6.2 mph. Tournatractor high in reverse is 8 mph.

Instant shifting

Constant-mesh transmission aids high-speed performance by eliminating delays in changing gears . . . saving vital momentum . . . gives you any gear ratio instantly. Tournatractor works in higher gear ratios because there is no loss of momentum for shifting. Torque converter increases this advantage by giving you wide automatic over-lapping of gear ratios, without depending on operator to jockey levers to get the most effective ratio of power and speed to load.

Ample flotation and traction

2' wide tires stay on top of soft ground instead of digging in. Lugs bite into underfooting to give traction. Tire pressures as low as 20 lbs. absorb shock. Rolling action compacts loose materials far more effectively than crawlers.

Lower maintenance

There are 4 easy-rolling-wheel-assemblies as compared to more than 500 wearing parts in standard track-assemblies. This means less maintenance. Dollar-wise this reduction in maintenance time can mean a saving of $3 per hour in operating expenses.

Easier to operate

Fingertip electric controls work at the flick of a switch. Steering, raising and lowering the blade, and operating the power-control-unit are all handled by buttons on dashboard. There are no levers, wheels, or other manual controls to handle. Big, low-pressure tires greatly reduce jars and jolts, stress and strain, on both operator and machine.

Interchangeable equipment

Adding to Tournatractor's versatility are a number of interchangeable attachments . . . Bulldozer, Angledozer, Root Rake, Snow Plow. This versatile tractor can also be equipped with a Push-Block, Logging-Winch or Tree-Pusher for additional applications. Drawbar and PCU are available for hauled equipment. Electric-control, open-top scrapers are also available for use with Tournatractors.

Find out for yourself how Tournatractor's go-anywhere mobility and 19 mph speeds can help you get more work done. Compare this rubber-tired tractor alongside your present crawlers. Write or call for a demonstration.

Tournatractor—Trademark Reg. U.S. Pat. Off. T-926-G-I

LeTourneau-WESTINGHOUSE Company

Peoria, Illinois

A Subsidiary of Westinghouse Air Brake Company

Only 9 men per shift are needed to operate $1,300,000 Yankeetown Dock Corporation installation. F-M Diesel Engine, Caterpillar switch engine, car tipper, breaker plant, 115 coal cars, gob truck and conveyor are lubricated with STANOLITH Grease MP.

This "3 in 1" Indiana coal mining group chooses STANDARD

Elva Nordhorn (right), assistant superintendent, Yankeetown Dock Corporation and Standard Oil industrial lubrication specialist Bill Griswold inspect car tipper. Bill Griswold is one of two experienced lubrication specialists in Standard's Evansville office who provide technical service. Bill is well qualified for the job. He has 30 years with Standard.

Two Indiana mines and their processing-shipping unit use STANDARD lubricating oils, fuels and greases; get three-way benefit.

Victoria and Wright Mines and Yankeetown Dock Corporation, in Southern Indiana, comprise one of the world's top-flight coal producing operations. This mining group delivers a million tons of coal a year to Clifty Creek power plant near Madison, Indiana. The power plant, in turn, produces electric power for an atomic energy installation nearby.

Both of the mines and the service facility depend upon Standard Oil Company for fuels, lubricating oils and greases. Across the page are three reasons why:

This 4 foot wide conveyor belt transports coal 1,105 feet from breaker plant to Ohio River loading dock. Loaded barges move up river to Clifty Creek power plant at Madison, Indiana. Conveyor system is lubricated with STANOLITH Grease MP. Conveyor operates two shifts per day the year 'round.

1. Standard's experienced mine lubrication technical service.

On-the-spot lubrication technical service is provided the mines and dock by two experienced men from Standard's Evansville office. These industrial lubrication specialists know mine lubrication. They are backed up by technical help from the Standard Oil headquarters office and laboratories. Headquarters for the mines and dock are in Chicago, Kansas City, St. Louis and Indianapolis. Standard Oil has offices in these cities with industrial lubrication men on hand to give assistance whenever needed. Mine and dock operations thus receive complete lubrication technical service support.

2. Standard's high quality and complete line of fuels, lubricants and greases.

Lubricants and fuels that keep equipment in service and minimize maintenance, contribute much to making this—or any—installation a profitable operation. The quality lubricants and fuels the mines and dock unit buy from Standard deliver top performance day after day, rain or shine, hot or cold, spring, summer, fall, winter.

3. Standard's fast delivery and dependable service.

Warehouse facilities in Boonville, less than 5 miles away, serve the mines and dock. Stocks of recommended lubricants warehoused there, back up inventories at the site. Stock control holds requirements to necessary levels. Fast delivery from refinery assures an uninterrupted flow of required oils, fuels, greases; provides the mines and dock with the third big reason for buying from Standard.

Could your mine profit from services such as these provided by Standard Oil? Perhaps Standard fuels and lubricants could give a new look to your operations. Find out. Call your nearby Standard Oil industrial lubrication specialist. There is one near you in any of the 15 Midwest and Rocky Mountain states. Or write Standard Oil Company, 910 South Michigan Avenue, Chicago 80, Illinois.

At the Wright Mine pit, Marlin Carter (right), foreman, and Standard Oil lubrication specialist Oscar Daussman discuss lubrication. Oscar has been helping customers with lubrication problems all of his 30 years at Standard. Customers look to Standard for this kind of help.

Marion 5561 stripper removes overburden, Marion 151M loading shovel loads coal haulers at Victoria Mine. Two mines and dock operate as one integrated unit. Facility is one of the world's largest, most modern coal mining and handling systems.

One of Victoria Mine's 25 ton Euclid coal haulers unloads into waiting coal car. Trucks haul coal to railroad spur, railroad transports coal to breaker plant. Whole system uses Standard lubricants and fuels.

STANDARD

STANDARD OIL COMPANY
(Indiana)

with COLMOL®

an average production of 25 tons per payroll man

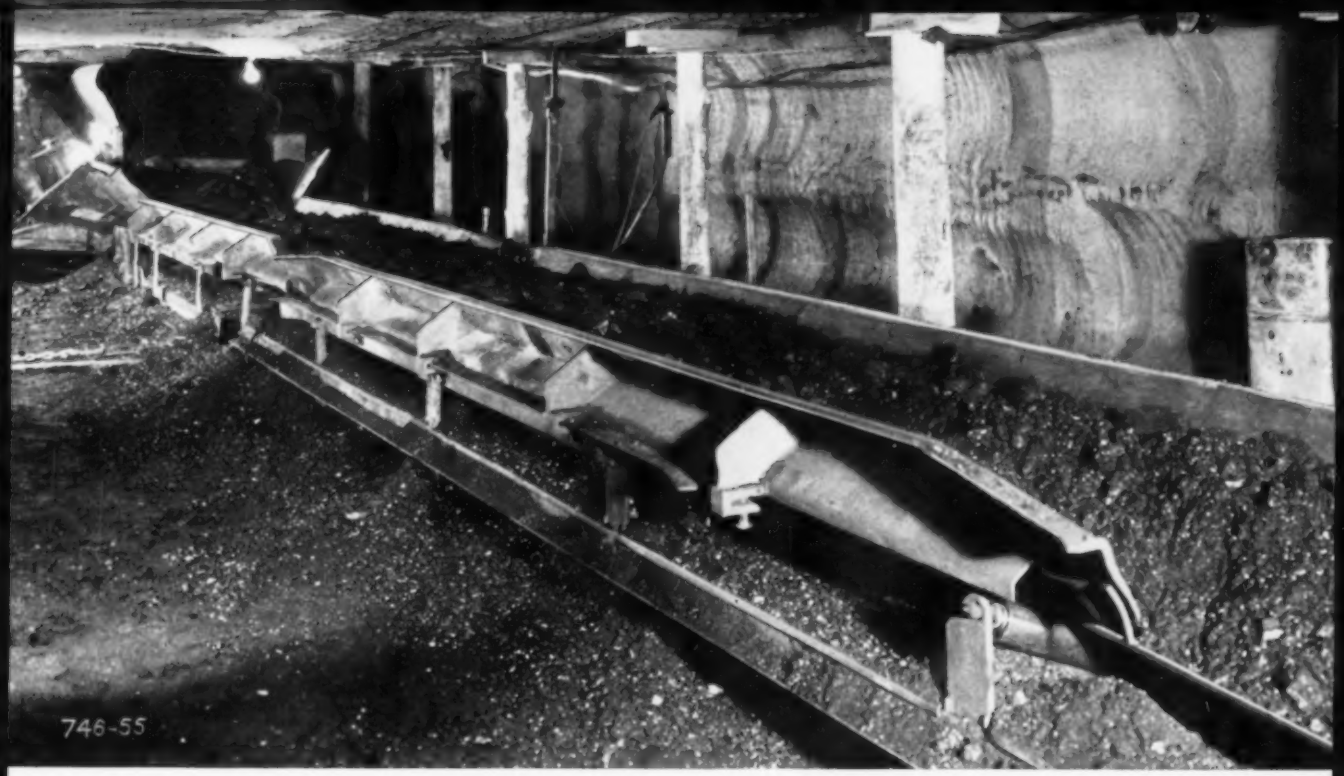
Peck's Run Coal Company, Upshur County, West Virginia, reports after two years' experience with their Colmol:

High average shift tonnages mined at lower cost; 25 tons per man on the payroll.

- Roof support costs were reduced and safety was increased, because no explosives are used.
- Bit costs are very reasonable, even though coal has a medium-hard structure, and sulphur balls and pyrite lenses occur frequently.
- Coal quality is better than obtained by conventional mining methods; ash reduced from 8.7% to 7.0% and sulphur reduced from 3.0% to 2.4%.

Redstone seam, mined since 1917, ranges in height from 50" to 72"; mainly 54" to 68". High ash and high sulphur layers persist throughout the property immediately adjacent to the top and bottom of the seam. Strict supervision of mining keeps these operations in the desirable, narrower coal where the seam is good.

A Jeffrey 76-B Colmol, with a mining range of 50½" to 66", working at Peck's Run.



A 30" Jeffrey 52-B belt conveyor at Peck's Run.

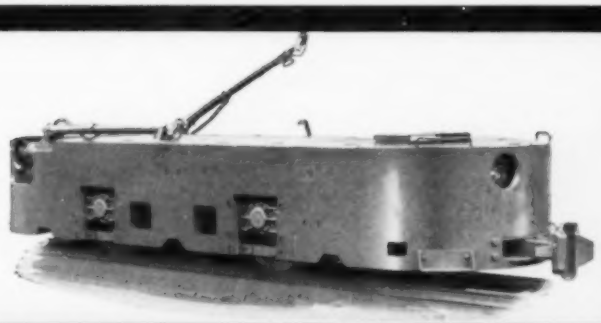
In solid mining, 3 entries are driven on 60′ centers, with a 30" Jeffrey belt conveyor in the center entry. Single panels are developed to left and right at a 60° angle, limited to 5 blocks in depth, 80′ wide by 90′ deep, so the longest haul to the belt is 450′. Places are driven two widths of the Colmol, or 19′ wide.

The resulting pillars, 62′ by 72′, are split through by driving two widths of the Colmol. The remaining two stumps are removed by single width advances of the Colmol, leaving small triangular pillars, which make adequate roof supports, until falls are made. One block gives about 870 tons.

Present operation is three shifts, two of which are full production of about 450 tons average. The third shift mines 100 to 300 tons, since it is principally engaged in inspection, maintenance and lubrication of equipment, supplying and advancing the belt line. They also finish up places that will permit the Colmol to start the next production shift to better advantage.

The three shifts total from 1000 to 1200 tons per day, the entire output of the mine. Single shift production in excess of 600 tons has been obtained with this Jeffrey unit.

A 15-ton Jeffrey trolley locomotive hauls the coal to the tipple in 8-ton, 8-wheel mine cars for picking, crushing, sizing, and loading into railroad cars. A cleaning plant is now under construction at Peck's Run Coal Company.



The Jeffrey Manufacturing Company, Columbus 16, Ohio. District Offices in Beckley, Birmingham, Chicago, Denver, Harlan, Pittsburgh, Salt Lake City.

JEFFREY

MINING • CONVEYING • PROCESSING EQUIPMENT • TRANSMISSION MACHINERY • CONTRACT MANUFACTURING

CHAMPS OF EVERY

NEW 1956 CHEVROLET

WEIGHT CLASS! CHEVROLET

New Chevrolet trucks for '56 bring you new heavies, middleweights and lightweights in eight great new series—new power and performance to save more money on your hauling job!

New Heavyweights—New Tandems! All-new heavyweights in 9 wheelbases, with maximum G.V.W. ratings up to a new high of 32,000 lbs.; G.C.W. up to 50,000 lbs.

Ultra-Modern Features! Tubeless tires, standard; High-Level ventilation and panoramic visibility; plus Concealed Safety Steps on most models.

Wider Range of Drives! There's an automatic drive in every series with new Powermatic for most middleweights and heavies; Hydra-Matic for light-duty models. Both extra-cost options. A new 5-speed transmission is standard in 9000 and 10000 series models; optional at extra cost in other heavies and most medium-duty models. New heavy-duty 5-speed is an extra-cost option in models with new Loadmaster V8.

A Modern V8 for Every Model! And introducing the completely new 322-cu.-in. Loadmaster V8, standard in new 9000 and 10000 series heavyweight models.

See Your Chevrolet Dealer and his new Task-Force line before you buy. . . . Chevrolet Division of General Motors, Detroit 2, Michigan.

TASK·FORCE TRUCKS

Ever see a stronger-looking drift?

Strength and safety rule supreme in this progressive ore mine, where Bethlehem's Yieldable Arch mine roof support is heavily employed. It's hard to imagine a cave-in or subsidence here!

The Yieldable Arch is formed of steel, which means it has both strength and durability. Each Yieldable Arch set consists of rolled-steel segments, heavily flanged to resist torsion and designed to nest into one another at points of overlap. Joints are made with U-bolt clamps drawn tight enough to hold fast under normal loads. When unusually heavy pressures begin to bear down, the joints permit the nested segments to slide or yield before deformation of the steel can occur. The load is thus relieved and the structural integrity of the arch is maintained.

Horizontal braces or struts, secured to the arches by special J-bolt clamps, tie the arches together and contribute lateral stability to the structure. Lagging, such as the type shown in the illustration, is recommended wherever possible for maximum effect.

A Bethlehem engineer would like to discuss the Yieldable Arch in full detail with you, without any obligation on your part, of course. A visit to your workings would be helpful to him in making recommendations, and he will be glad to arrange such a trip at your convenience.

BETHLEHEM STEEL COMPANY
BETHLEHEM, PA.

On the Pacific Coast Bethlehem products are sold by Bethlehem Pacific Coast Steel Corporation
Export Distributor: Bethlehem Steel Export Corporation

BETHLEHEM STEEL

BETHLEHEM STEEL

Enjoy These FOUR FREEDOMS

Freedom from Maintenance

1 Breaker is carried on four heavy-duty, anti-friction bearing trunnions. Breaking plates are heavy-duty cast abrasion-shock resistant steel. Corresponding heavy frame construction eliminates costly maintenance.

Freedom from Oversize

3 Since all material must pass through the pre-determined breaker plates which have equivalent round hole perforations cast in the plates, there is no more possibility of oversize reaching your preparation plant than there would be if round hole shaker screens were employed.

Freedom from Plant Feed Interruptions (Blockage)

2 It is not necessary to provide preliminary inspection of run-of-mine feed for removal of rock, rail, and other foreign material that cause blockage in your present coal crushing equipment. Furthermore, if rock is extremely hard, it is removed from your run-of-mine at the discharge eye of the breaker, thereby lessening load on washing equipment.

Freedom from Excessive Fines

4 The stationary prescreen, plus the rotary screen action of the breaker, gives an immediate by-pass for the normal minus product existing in the feed. Therefore, near particle sizes are not subjected to further crushing action.

PILE UP COAL PROFITS

... with the New McNally Rotary Breaker

Ask

the men who know coal from the ground up

McNALLY PITTSBURG

MANUFACTURERS OF EQUIPMENT TO MAKE COAL A BETTER FUEL

McNally Pittsburg Manufacturing Corporation—Manufacturing Plants: Pittsburg, Kansas • Wellston, Ohio Engineering and Sales Offices: Pittsburgh • Chicago • Rio de Janeiro • Pittsburg, Kansas • Wellston, Ohio

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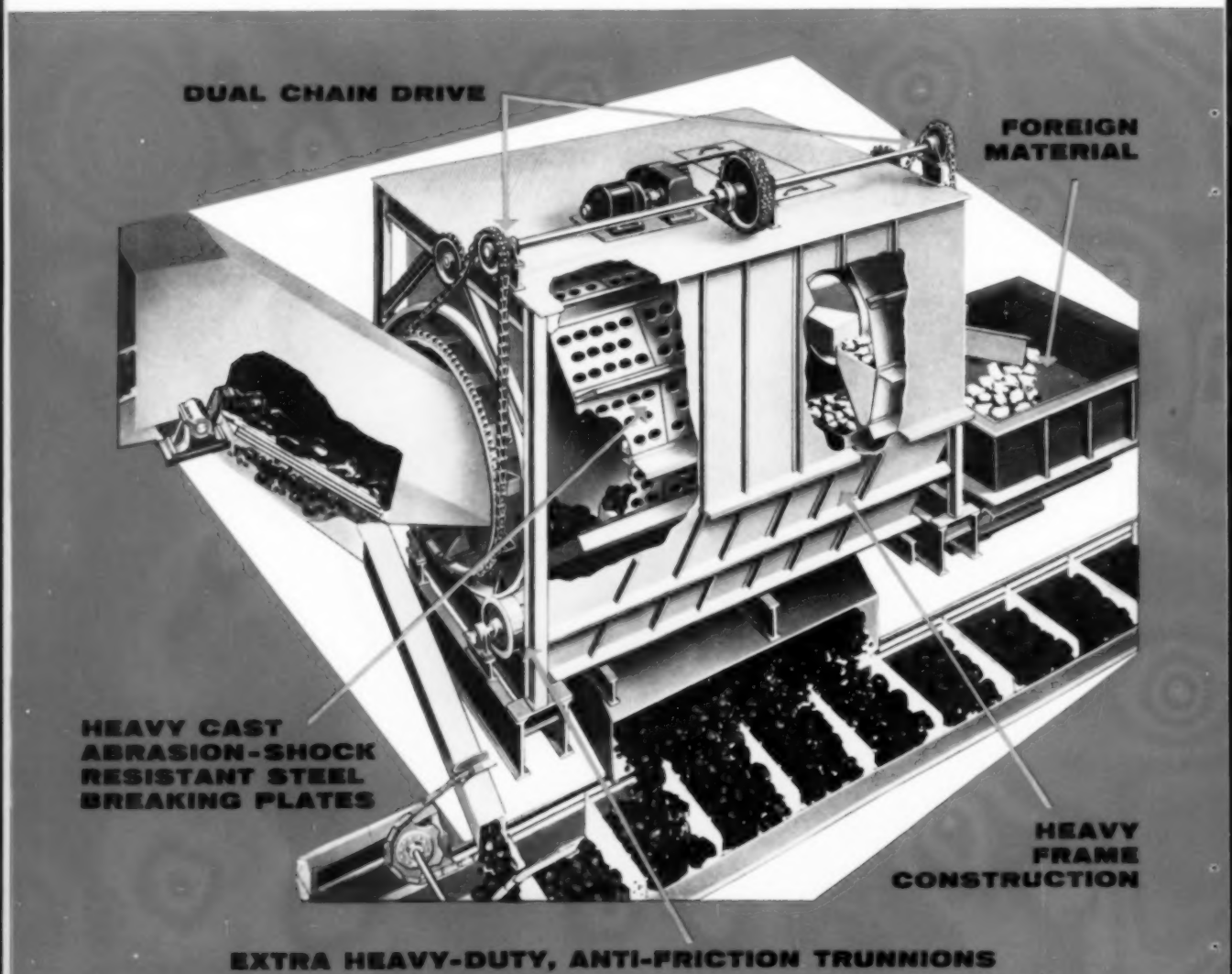
4c-POSTAGE WILL BE PAID BY—

McNally Pittsburg Mfg. Corp.

PITTSBURG, KANSAS

THIS IS THE BREAKER

THAT BRINGS YOU ALL FOUR FREEDOMS . . . FOR PROFIT



Gentlemen:

Please send information on how we can use the McNally Pittsburg Rotary Breaker. Here are our requirements:

Indicate coal seam and seam number_____. Top size of run-of-mine fed to breaker_____. Top size required in breaker production_____. Percentage of foreign matter in feed_____. Do you have screen analysis of run-of-mine?_____

Name_____ Title_____

Company_____

City and State_____

☐ Have Sales Engineer call for further consultation.

C

You, too, can compete—
with better prepared
coals—at lower cost
per ton

Ask the men who know coal from the ground up

McNALLY PITTSBURG
MANUFACTURERS OF EQUIPMENT TO MAKE COAL A BETTER FUEL

McNally Pittsburg Manufacturing Corporation—Manufacturing Plants: Pittsburg, Kansas • Wellston, Ohio Engineering and Sales Offices: Pittsburgh • Chicago • Rio de Janeiro • Pittsburg, Kansas • Wellston, Ohio

Now–Du Pont Offers Two New Blasting Agents for Overburden Shooting

Seven reasons why new Du Pont "Nitramite" and Du Pont Akremite* will meet your blasting needs

	DU PONT "NITRAMITE"	DU PONT AKREMITE*
√ **AVAILABILITY** *Large diameters only*	Manufactured and sold throughout the country in a wide variety of sizes.	Can be manufactured and used under sublicensing arrangement from licensed manufacturers or purchased for use from said manufacturers.*
√ **ECONOMY**	Popular combination of high strength and low cost.	Lowest-cost blasting agent developed to date.
√ **VERSATILITY**	Excellent blasting action in both hard and soft materials and either vertical or horizontal holes.	Proven performance in bituminous-coal strip pits. Potential application in wide variety of bank shooting.
√ **WATER RESISTANCE**	Good water resistance—can be loaded in water if shot within eight hours.	Recommended for loading in substantially dry holes. Package is moisture-resistant.
√ **SAFETY**	Cannot be accidentally detonated by shock, friction, rifle bullets, "Primacord," or a blasting cap. Should be primed with a special insensitive "Nitramite" Primer, which must be initiated with "Primacord."	Cannot be accidentally detonated by shock, friction, rifle bullets, "Primacord," or a blasting cap. May be primed with dynamite in standard wrappers or flexible plastic bags, or for maximum safety, "Nitramite" Primers.
√ **CONVENIENCE**	Furnished in a substantial container that is easy to handle and load—even in usually troublesome horizontal holes.	Packaged in a flexible plastic bag that loads easily and conforms to shape of borehole.
√ **NO HEADACHES**	Contains no Nitroglycerin and cannot produce "powder" headaches.	Contains no Nitroglycerin and cannot produce "powder" headaches.

E. I. du Pont de Nemours & Co. (Inc.),
Wilmington 98, Delaware

**Licensed exclusively to the Du Pont Company under the Maumee Collieries Company Process Patent No. 2,703,528.*

DU PONT BLASTING AGENTS

Blasting Supplies and Accessories

DU PONT
REG. U.S. PAT. OFF.

BETTER THINGS FOR BETTER LIVING . . . *THROUGH CHEMISTRY*

G-E Mine Locomotives Increase Output 1125 Tons a Day for Christopher Coal

At Christopher Coal Company's mines in Pursglove, West Virginia, four General Electric 50-ton high-speed haulage locomotives have increased output by 1125 tons of coal daily. The four G-E 50-tonners replace the equivalent of eight 27-tonners of the type previously used. One 50-ton unit hauls out 25 tons more coal per trip than two of the 27-ton locomotives operating in tandem. And, maintenance has been so markedly reduced that four skilled men have been released for other important jobs.

Christopher Coal gets higher production because their G-E mine haulage locomotives are specifically designed for high-speed, heavy-duty operation. They carry heavier loads faster, requiring fewer locomotives, trains and crews. They reduce haulageway congestion and production delays, and simplify despatching. Their four-axle, swivel-truck design results in smooth riding with reduced wear. Less wear has effectively cut Christopher's maintenance costs. ●

WHAT ARE YOUR HAULAGE REQUIREMENTS? From the wide range of G-E industrial and mine locomotives—diesel-electric and electric, for both underground and surface haulage—there is one fitted to your needs. For a survey of your haulage requirements, without cost or obligation, call your G-E Apparatus Sales Engineer, Locomotive & Car Equipment Dept., General Electric Company, Erie, Pa. 12B-8B

GENERAL ELECTRIC

The chain that... thrives on abuse!

Standard Rivetless Chain available in 4" to 9" pitches to fit standard equipment.

The more it's used the harder it gets!

That's because it's made from KENKROME, the remarkable wear-defying alloy that was perfected after years of experimentation by Kensington engineers and metallurgists.

KENKROME is no ordinary steel ... in fact it's no ordinary manganese steel. There's no other steel quite like it.

Addition of special alloying metals under a patented process, plus Kensington's own scientific method of heat treatment, have created this remarkable metal which outwears ordinary steel *2 to 4 times* ... which actually defies wear by developing surface hardness under impact to better enable it to withstand abrasion. Beneath this continually hardening surface, the metal always remains tough ... better able to withstand shock than metals that are hard all the way through.

But Kensington's wear-conquering engineers didn't stop with development of the metal itself. They improved the design of many standard parts ... reinforced those which needed strengthening ... reduced the number of moving and wearing parts on some ... reshaped others to add extra service life.

The renewable tooth sprocket, shown at the right, is a good example of Kensington's improved design. When outer segments need replacing, the entire change can be completed by a couple of men during lunch hour ... without even removing the chain. A new set of teeth costs only a fraction of what you'd pay for a complete one-piece sprocket.

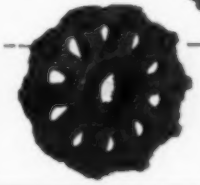
KENKROME chains and sprockets are built to fit all standard conveyors and elevators used in mines and preparation plants. Consider the low initial cost, low replacement cost, and advantages of continuous, uninterrupted plant operation. It will pay YOU to *Switch to KENKROME!*

To find what it would cost, fill in and mail coupon. You'll be under no obligation.

Other wear-resisting alloyed ORO manganese replacement parts

Long-wearing, long lasting dipper tooth points and bases.

Treads for all sizes and types of shovels and draglines.



Crawler sprockets available for most shovels and draglines.

Kensington STEEL COMPANY

KENSINGTON STEEL CO., Dept. C, 505 Kensington Ave., Chicago 28, Ill.

SUBSIDIARY OF POOR & COMPANY • CHICAGO

☐ Please quote prices ☐ Please ask salesman to call

Chain Information { CHAIN NO. TYPE LENGTH; ATTACHMENT NO. (OR 2 BOLT PINS) SPACED EVERY PITCH

Sprocket Information { CHAIN NO. NO. TEETH SHAFT DIA.; HUB LENGTH { CENTRAL ☐ KEYWAY OFFSET ☐ BUSHED

NAME

COMPANY

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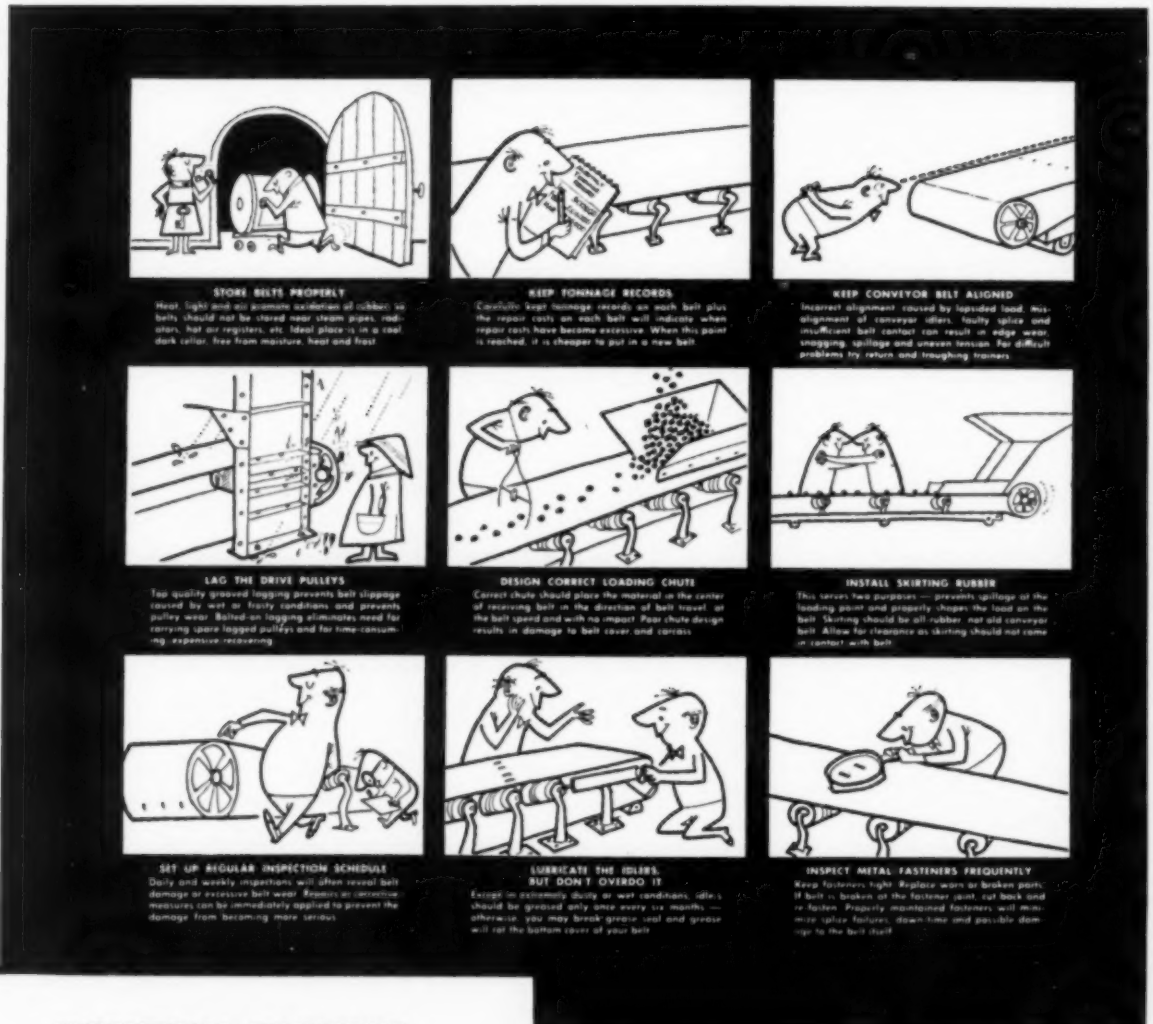
CITY ZONE STATE

MORE CARRY IN YOUR

Free Wall Chart gives


STORE BELTS PROPERLY
Heat, light and air accelerate oxidation of rubber; so belts should not be stored near steam pipes, radiators, hot air registers, etc. Ideal place is in a cool dark cellar, free from moisture, heat and frost
KEEP TONNAGE RECORDS
Complete kept tonnage records on each belt plus the repair costs on each belt will indicate when repair costs have become excessive. When this point is reached, it is cheaper to put in a new belt
KEEP CONVEYOR BELT ALIGNED
Incorrect alignment caused by lopsided load, misalignment of conveyor idlers, faulty splice and insufficient belt contact can result in edge wear, snagging, spillage and uneven tension. For difficult problems try return and troughing troiners
LAG THE DRIVE PULLEYS
Top quality grooved lagging prevents belt slippage caused by wet or frosty conditions and prevents pulley wear. Bolted-on lagging eliminates need for carrying spare lagged pulleys and for time-consuming, expensive recovering
DESIGN CORRECT LOADING CHUTE
Correct chute should place the material in the center of receiving belt in the direction of belt travel, at the belt speed and with no impact. Poor chute design results in damage to belt cover and carcass
INSTALL SKIRTING RUBBER
This serves two purposes — prevents spillage at the loading point and properly shapes the load on the belt. Skirting should be all-rubber, not old conveyor belt. Allow for clearance as skirting should not come in contact with belt
SET UP REGULAR INSPECTION SCHEDULE
Daily and weekly inspections will often reveal belt damage or excessive belt wear. Repairs or corrective measures can be immediately applied to prevent the damage from becoming more serious
LUBRICATE THE IDLERS, BUT DON'T OVERDO IT
Except in extremely dusty or wet conditions, idlers should be greased only once every six months — otherwise you may break grease seal and grease will rot the bottom cover of your belt
INSPECT METAL FASTENERS FREQUENTLY
Keep fasteners tight. Replace worn or broken parts. If belt is broken at the fastener joint, cut back and re-fasten. Properly maintained fasteners will minimize splice failures, down-time and possible damage to the belt itself

INDUSTRIAL DIVISIONS
PRODUCTS

CONVEYOR BELTING · CONVEYOR MACHINERY
INDUSTRIAL HOSE · VIBRATING CONVEYORS
VIBRATING SCREENS · DESIGN, MANUFACTURE,
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COMPLETE BULK MATERIALS HANDLING SYSTEMS
"GLIDE RIDE" THE NEW MOVING SIDEWALK

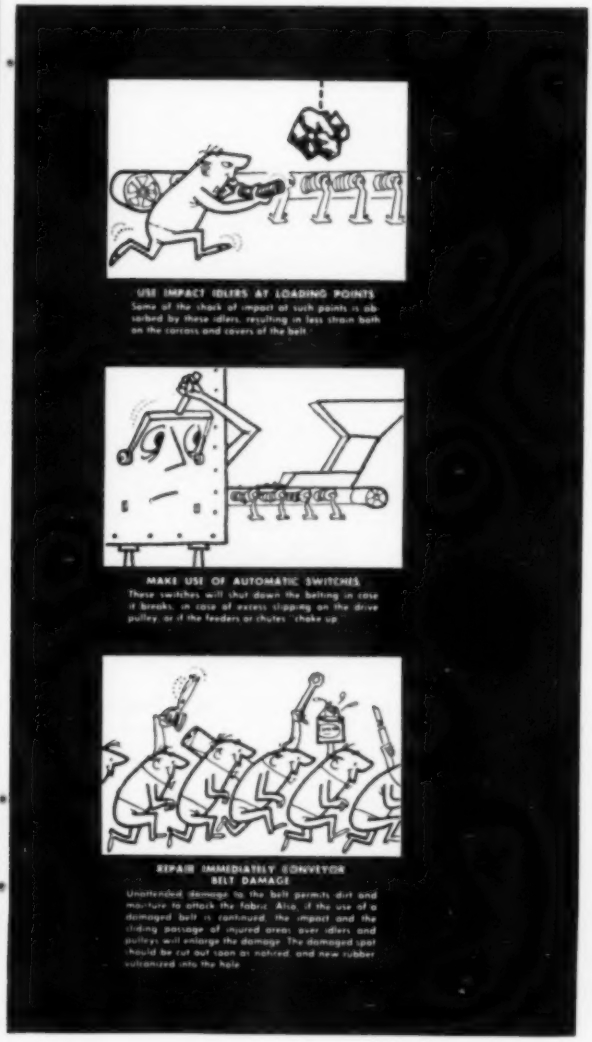
This wall chart, 23" x 33" in two colors, has many valuable tips that will enable you to increase the life of your conveyor belting. To obtain a copy, contact

HEWITT

INCORPORATED · EXECUTIVE

CONVEYOR BELTING

the answers


USE IMPACT IDLERS AT LOADING POINTS
Some of the shock of impact at such points is absorbed by these idlers, resulting in less strain both on the carcass and covers of the belt.
MAKE USE OF AUTOMATIC SWITCHES
These switches will shut down the belting in case it breaks, in case of excess slipping on the drive pulley, or if the feeders or chutes choke up.
REPAIR IMMEDIATELY CONVEYOR BELT DAMAGE
Unattended damage to the belt permits dirt and moisture to attack the fabric. Also, if the use of a damaged belt is continued, the impact and the sliding passage of injured areas over idlers and pulleys will enlarge the damage. The damaged spot should be cut out soon as noticed, and new rubber vulcanized into the hole.

Which is the best belt for you?

For Mining *(Metallic and Nonmetallic)*

Maltese Cross for especially severe service. Ajax for general heavy duty service, and Conservo for general light duty service. Exceptionally severe special conditions may require use of specially designed Hewitt-Robins belts such as Shock Pad, CR-50 and CR-70, Raynile and Super-Raynile, Ajax Underground and Monarch Neoprene fire-resistant belting.

For Metal Processing

Maltese Cross for exceptionally severe service. Ajax for general heavy duty service, and Monarch Neoprene for oily service. Maltese Cross Fiberglas Hot Material, Maltese Cross Fabric-type Hot Material and Hewitt Hot Service are especially designed for hot material handling.

For Public Utilities

Monarch Neoprene for oily service, Maltese Cross Hot Material and Hewitt Hot Service for hot material handling. Maltese Cross for especially severe service and Ajax for general heavy duty service.

For Food Processing

Canners and Packers and Hewlite for food handling, Monarch Neoprene for oily service, Ajax Rufftop, Conservo Rufftop and Conservo Transport for package handling. Monarch, Ajax and Conservo for grain and feed handling.

For Materials Handling

Conservo for portable conveyors. Ajax Rufftop, Conservo Rufftop, Conservo Transport and Hewlite for packaging conveyors.

For Chemical Processing *(Including Pulp and Paper)*

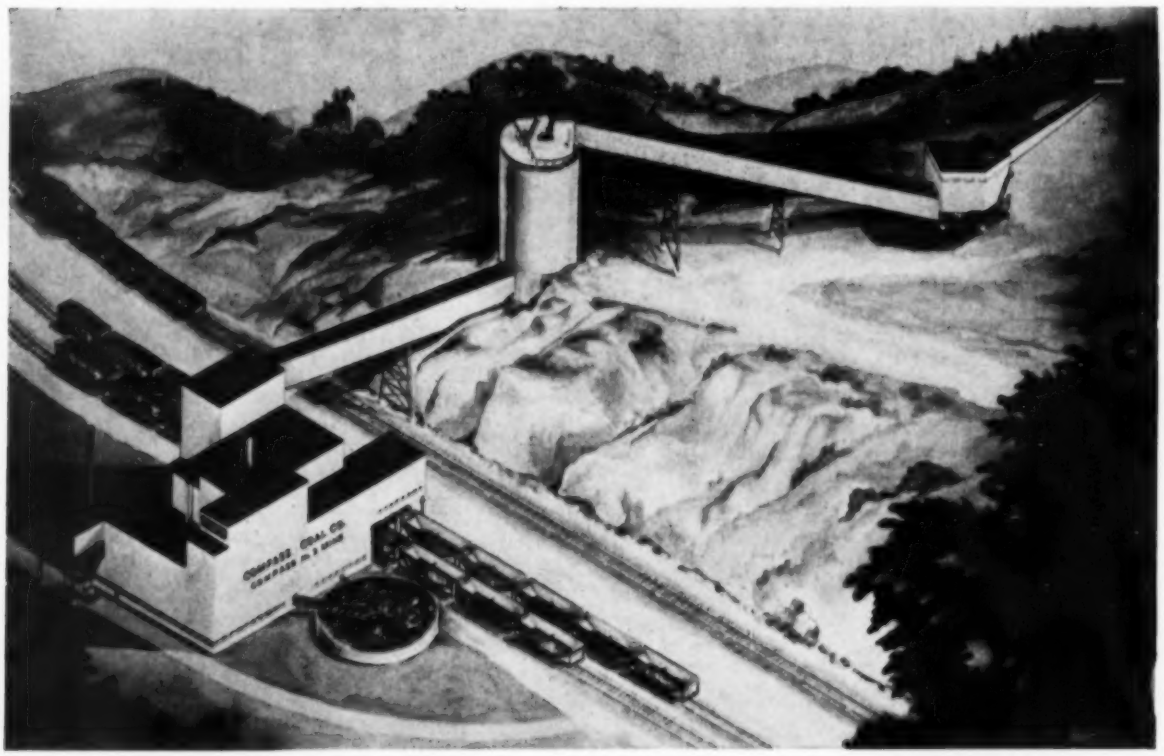
Maltese Cross for exceptionally severe service, Ajax for general heavy duty service, and Conservo for general light duty. Maltese Cross Fiberglas Hot Material, Maltese Cross Fabric-type Hot Material and Hewitt Hot Service are especially designed for hot material handling.

FOR SERVICE AND INFORMATION ON BELTING AND HOSE CALL YOUR LOCAL HEWITT-ROBINS INDUSTRIAL SUPPLY DISTRIBUTOR LISTED IN THE "YELLOW PAGES"

your local HR Industrial Supply Distributor or write to our executive offices in Stamford, Connecticut.

HR ROBINS

OFFICES: STAMFORD, CONN.



FAIRMONT

. . . the modern approach to coal preparation

In over half a century of continuous operation, Fairmont Machinery Company has kept abreast of the latest developments in coal cleaning and has become nationally known as a leader in the design, fabrication and erection of coal preparation plants.

Fairmont's policy of qualified, coordinated planning has resulted in consistent economy for coal producers throughout the bituminous coal industry.

This coordinated responsibility has provided top separating efficiency through....

1. *Coordinated design, engineering, fabricating and erecting services.*
2. *Independent choice of equipment best adapted to specific requirements.*
3. *Pilot crews provided to instruct permanent crews.*
4. *A well-planned installation that amply meets present needs while providing for the future.*

To upgrade your coal product and guarantee its uniformity... call a Fairmont Engineer! Over 99% separating efficiency through a wide product size range of ⅛ to 10" in any tonnage capacity, is available through Fairmont-Built coal preparation plants.

FAIRMONT MACHINERY COMPANY

FAIRMONT, WEST VIRGINIA

DESIGNERS AND CONSTRUCTORS OF COMPLETE COAL PREPARATION PLANTS USING BOTH WET AND DRY CLEANING, CENTRIFUGAL AND THERMAL DRYING.

INTERNATIONAL TRUCKS

First choice of men who know 6-wheel costs

Model RF-202 — gasoline-powered 6-wheeler, 41,000 lbs. GVW.

Now — *NEW* Gasoline, LPG and Diesels for a total of *101* models

SF-180 Series—GVW rating, 30,000-33,000 lbs. GCW, 45,000 pounds. Gasoline or LPG engines.

RF-200 Series—GVW, 37,000-41,000 lbs. GCW, 65,000 lbs. Royal Red Diamond 212-hp gasoline engine, optional.

RDF-210-H Series—GVW rating, 37,000-45,000 lbs. Diesel-powered. For highway or off-highway service.

RDF-214-H—GVW rating, 45,000 lbs. Diesel-powered. For heavy off-highway service.

RDF-230-H—GVW rating, 60,000 lbs. Diesel-powered. For heavy off-highway service.

DF-400 Series—GVW rating, 40,000 lbs. GCW rating, 76,800 lbs. Diesel-powered. For highway or off-highway service.

Here are 3 BIG reasons why:

1. **World's Widest Range of 6-wheel Models.** The INTERNATIONAL 6-wheel truck line offers trucks of every size and type from 22,000 to 90,000 pounds GVW—conventional and COE, gasoline, LPG and diesel—all available in hundreds of variations for *exact* matching to the requirements of every job.

2. **Custom-Built on the Production Line.** Years of experience in volume manufacture has created unmatched ability for pinpoint specialization in production line assembly. This means appreciable production savings, and is one of many superiorities that have made INTERNATIONAL the 6-wheel truck leader for 21 straight years.

3. **Built to Last Longer, to Cut Costs.** INTERNATIONAL 6-wheel trucks are built and tested to take the toughest heavy-duty jobs you can hand them. They're built to stay on the job to *earn* money—out of the shop to *save* on operating and maintenance costs.

INTERNATIONAL HARVESTER COMPANY • CHICAGO

All-Truck Built to save you the BIG money!

INTERNATIONAL® TRUCKS

Motor Trucks • Crawler Tractors • Industrial Power
McCormick® Farm Equipment and Farmall® Tractors

Tumbling terrain buried more than 500 feet of 5-year-old Anaconda 3/0 Awg SH-D Shovel Cable. Despite accident, cable continued to supply power without interruption to giant shovel.

...and the wall came tumbling down

When this 90-foot wall came down unexpectedly, a five-year-old length of Anaconda 3/0 SH-D Shovel Cable was buried under thousands of tons of jagged rock.

Yet – *after ten days* – the cable and shovel it supplied continued to operate! Later, the cable was relocated–and is still giving service.

NEW BUTYL INSULATION

Longer life, better performing cable is the result of advanced engineering and manufacturing know-how that go into all Anaconda mine cables. Securityflex* Type SH-D Shovel Cable, for instance, is made with high-grade butyl insulation that withstands ozone, heat and moisture. Neoprene jacket is extremely tough and abrasion-resistant. Patented rubber cores cushion the ground wires and help prevent breaks.

Safety and economy of Anaconda cables have been proven in mines all over the world. The *Man from Anaconda* will be glad to help you on any cable problem. For cable, see your Anaconda distributor. And for copy of booklet, "*. . . and the wall came tumbling down,*" write: Anaconda Wire & Cable Company, 25 Broadway, New York 4, New York.

*Reg. U. S. Pat. Off. 56329

ASK YOUR DISTRIBUTOR FOR

Sharp corner of rock caught and held taut the Anaconda Shovel Cable – but didn't break it.

Giant rock scissors pinched the cable in viselike grip without damage to insulation or ground wires.

Like a guillotine, yet tons of rock did not puncture cable nor interrupt flow of power to the shovel.

Rockfall crushed and partially buried the cable all along its length – but not a single break occurred.

ANACONDA® MINE CABLE

SIX 45-TON ATHEY PH20 COAL HAULERS BOOST PRODUCTION AT TRUAX-TRAER

BIG TARGET LOADING! Athey PH20 offers a wide-open shovel target, 11′ wide and 22′ long! The PH20 Coal Hauler makes short, non-stop turns.

Truax-Traer Coal Company, Fiatt, Ill., operates a fleet of Athey-Cat PH20 Trailers in their Red Amber Mine operation in Fulton County, Ill. They are 45-ton, bottom-dump hauling teams designed specifically for big production coal hauling.

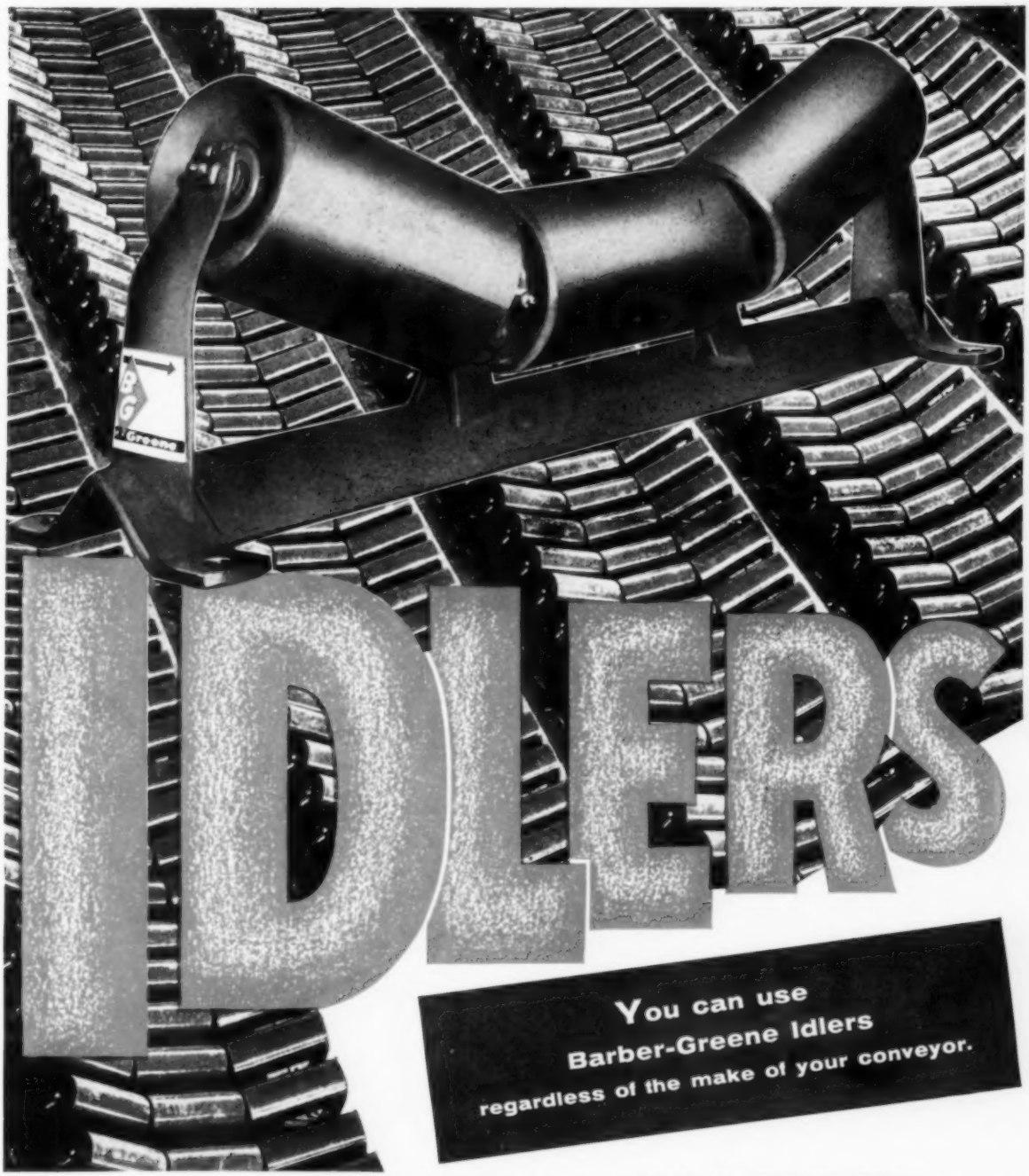
Truax-Traer works the units on a 3½ mile haul. The big Athey PH20's are setting new production records with big capacity, high-speed daily coal haulage. As Byron Somer, Supt. says, "You just can't catch the PH20's. Our drivers like these big coal haulers and they're very maneuverable."

Athey PH20 Coal Haulers stand up under tough schedules because they're built for big but profitable operation. Body and doors are made of premium, high-strength steel, which make the PH20 approximately 7 tons lighter than other 45-ton haulers. This means less deadweight, more pounds of payload for every pound of machine weight — more profit on every trip. See your Athey-Caterpillar Dealer.

ATHEY PRODUCTS CORPORATION
5631 West 65th Street, Chicago 38, Illinois

HIGH SPEEDS! Up to rated speed of 32.1 MPH from dependable, Cat Diesel Engine in Cat DW20 Wheel Tractor. 41% of loaded weight on big single-tire drive wheels. Hydraulic booster steering makes handling easy and sure.

QUICK, CLEAN DUMPING! Bottom doors open instantly by air release for quick dumps. Opening can be varied by operator to fit grizzley needs. When fully closed, doors lock with a positive, mechanical latch.



Available in all types, in all common sizes. Write for Bulletin 76C. 54-42-PE

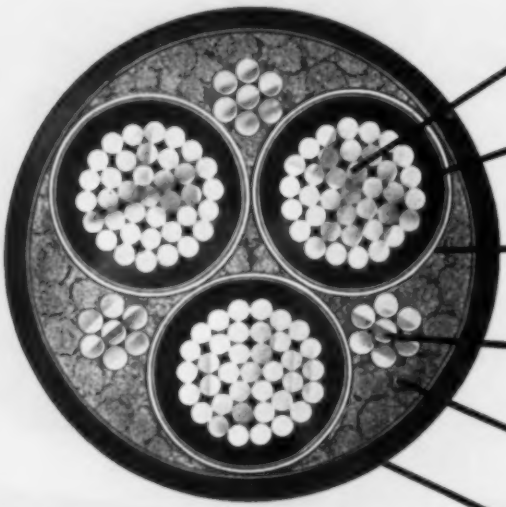
Barber-Greene BG

AURORA, ILLINOIS, U.S.A.

CONVEYORS . . . LOADERS . . . DITCHERS . . . ASPHALT PAVING EQUIPMENT

Cut costs with

CONSTRUCTION SPECIFICATIONS: Designed for dependability and safety. Type MPT is a product of Rome Cable research and engineering.



Power Conductor—ASTM Class B stranded, annealed bare copper, shielded with a semi-conducting tape.

Insulation—RoLene (polyethylene), complies with IPCEA and ASTM standards—suitable for maximum continuous conductor temperature of 75°C.

Electrostatic Shielding—Bare copper shielding tape over semi-conducting bedding tapes on each insulated conductor.

Grounding Conductors—ASTM Class B stranded bare copper—one grounding conductor in each interstice *in direct contact* with electrostatic shielding.

Assembly—Three shielded power conductors cabled with fillers and grounding conductors.

Sheath—Rome RoSeal, special black flame-resistant polyethylene, over the cabled and taped assembly—excellent mechanical and electrical properties.

For your other mining cable requirements the Rome 60 line includes:

- Parallel Duplex Shuttle Car Cables Types W and G
- Multiple Conductor Portable Power Cables Types W and G
- Type SO Portable Cords
- Single-Conductor Locomotive Cables
- Concentric Mining Machine Cables
- Multiple Conductor Combination Power and Control Portable Cables for Specific Applications,
- Shovel and Dredge Cables

new Rome • MPT

Mine Power and Industrial Feeder Cable—0 to 5000 Volts

NOW, you can cut the cost of mine power feeder cable installation. Rome Type MPT Mine Power Feeder Cable, specifically designed to be lighter in weight, smaller in diameter and, therefore, easier to handle than conventional rubber and Neoprene types of equivalent capacity, will save you real money. Further, you can economize with confidence, for in its construction, Type MPT represents the ultimate in safety for a nonmetallic sheathed cable.

Here is why you save with Type MPT:

- The original cable cost is less—as much as 28 percent in the case of 2 AWG 3-conductor, rubber and Neoprene sheathed—5 kv
- It is lighter in weight, compared to rubber and Neoprene . . . as much as 33 percent lighter in some instances
- Smaller diameters mean smaller fittings
- Greater ease of handling
- Long life because of its superior resistance to most chemicals, moisture, abrasion and mechanical damage
- Versatility of application

Where to install Type MPT

Rome Type MPT Mine Power Feeder Cable answers the needs of a variety of mine power problems. In addition, it is suitable for industrial use. Specifically, it is recommended for permanent or semi-permanent installation in a protected path, for example, in protected trays for horizontal runs or slopes . . . underground . . . end-suspended in bore holes . . . grip-suspended in vertical shafts or hung aerially from messenger and supporting insulators. Part of its versatility comes from its semi-portability, making it easy to relocate, whenever necessary.

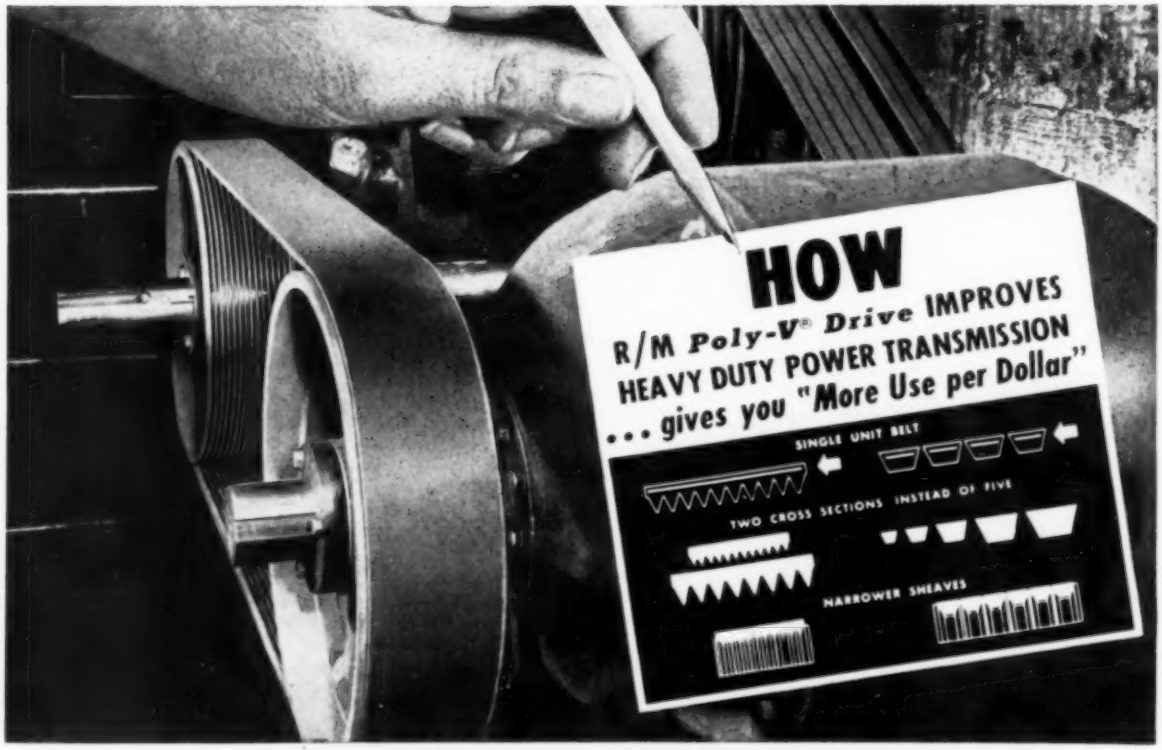
It is safe

Rome Type MPT is designed for safe operation. Insulated power conductors are copper shielded for ground fault protection, while bare ground wires in direct contact with conductor shielding, assure low-resistance grounding in the event of shielding failure or ground faulting of equipment. Danger from fire is minimized by a high quality RoSeal (special flame-resistant polyethylene) sheath.

Rome Type MPT Mine Power Feeder Cable is available in sizes 6 AWG to 250,000 CM, generally as three-conductor and with ratings up to 5,000 volts. Let a Rome Cable sales engineer show you how Type MPT can save you money, safely. Contact your local Rome Cable representative or write Rome Cable Corporation, P. O. Box 71, Rome, New York.

It Costs Less to Buy the Best

ROME CABLE Corporation
ROME • NEW YORK
and
TORRANCE • CALIFORNIA


HOW
R/M Poly-V® Drive IMPROVES
HEAVY DUTY POWER TRANSMISSION
. . . gives you "More Use per Dollar"
SINGLE UNIT BELT
TWO CROSS SECTIONS INSTEAD OF FIVE
NARROWER SHEAVES

R/M *Poly-V® Drive*

"Trouble-Proofs" this Mine Fan Drive!

Less shaft overhang . . . *less* drive weight . . . *less* bearing load! The exclusive features of patented R/M Poly-V* Drive eliminated the primary causes of belt failure on the mine fan drive pictured above. Overheated bearings —even a broken jack shaft—threatened the supply of vital fresh air to an underground mine until engineers replaced the former drive with a new R/M Poly-V Drive with its space-saving, lighter weight. It's a new concept in heavy duty power transmission.

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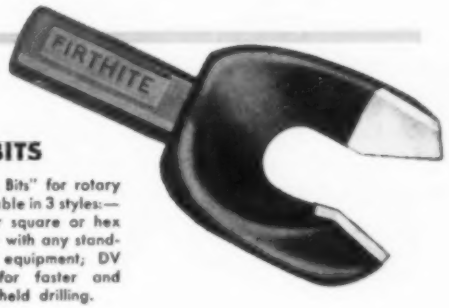

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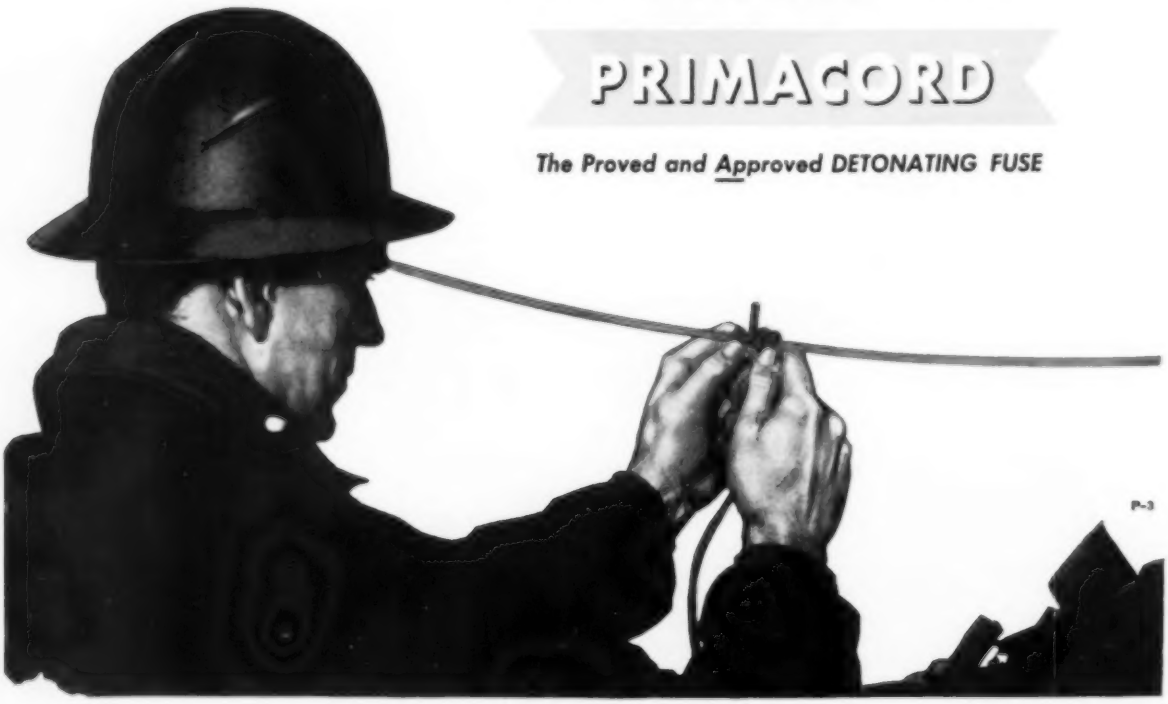


P-3

Devoted to the Operating, Technical and Business Problems of the Coal-Mining Industry

Coal Age

MARCH, 1956

IVAN A. GIVEN, EDITOR

Patient Willingness

A FAIR MEASURE OF AGREEMENT among observers of energy-supply needs of the U. S. is that the nation will need about 600 million tons of coal in 1960. This projected need for coal promises better days for mineworkers, carriers, customers and operators—but only if all are patiently willing to help the industry develop its productive capacity to this higher level.

If this spirit of patient willingness prevails, it is reasonable to assume that 1960, the target year, will show:

- For mineworkers, steady employment at efficient mines for highly trained men, and a growing balance in the welfare fund;
- For the carriers, sustained movement of large tonnages in all channels of transportation;
- For customers, high-quality coal in dependable supply at a realistic price;
- For the operators, a fair return on large investments in valuable properties and physical plants—and a reasonable surplus for investment in the necessary new and replacement capacity demanded by the 1960 figure.

This is the hub of the matter:

In the short five years ahead the industry faces the challenge of developing new and replacement capacity at a rate reminiscent of the war years (although there is so much more consolation in planning expansion for peace).

The total investment required for this increased capacity, with no subsidy asked or expected, is astounding. Each new ton of annual capacity in the 1956-1960 period will cost more than in any similar period in the past. The round-figure investment now required for new mines is about $10 per ton of annual capacity, and estimates of the need for such new capacity reach as high as 110 million tons in 1960 plus about 130 million tons in replacement capacity.

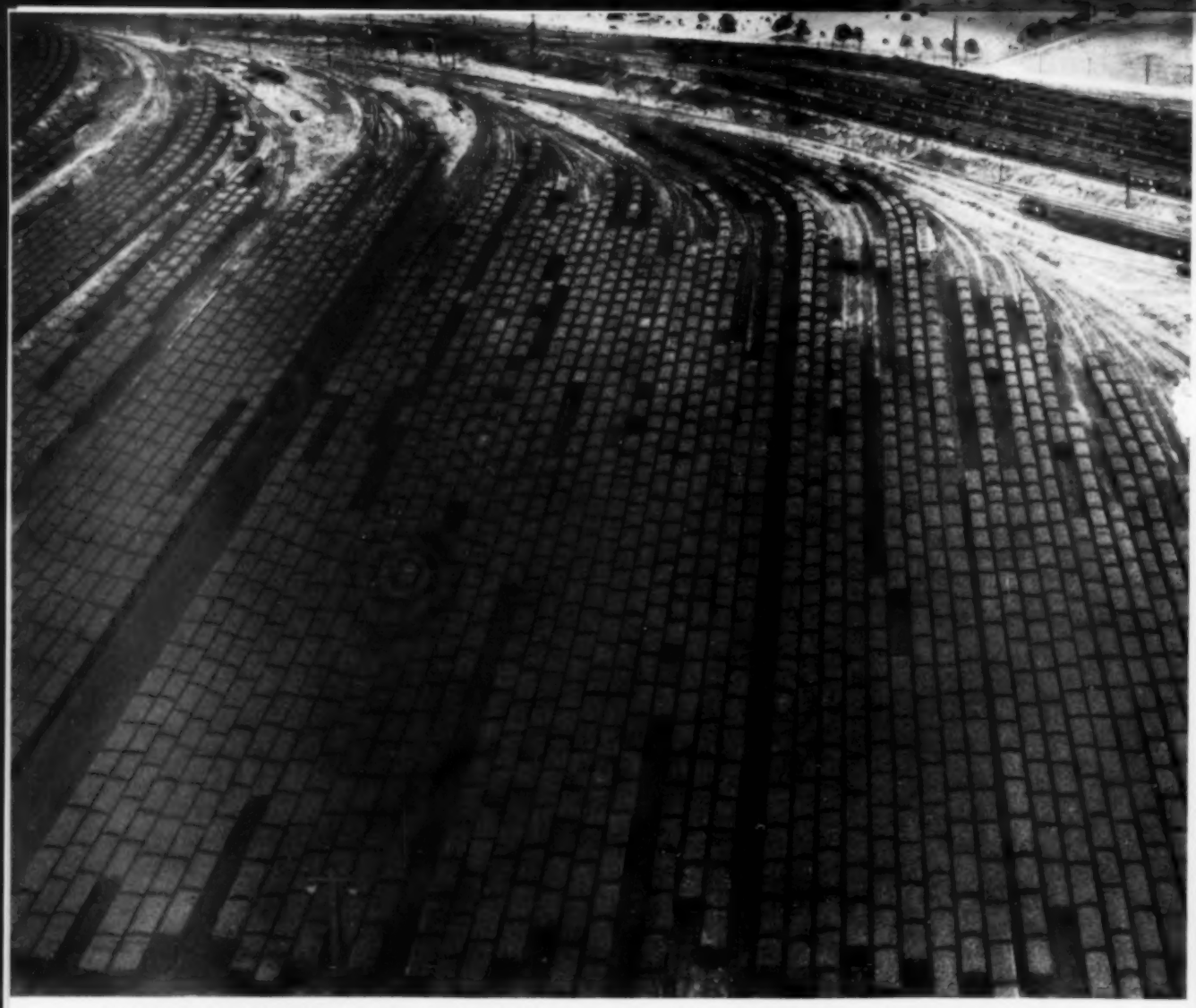
The mine price must be a direct reflection of management skill and engineering artistry in the selection of equipment and methods, and of reasonable conduct by all parties at all bargaining tables. It must of course include the reasonable surplus for investment.

What happens between the loading boom at the mine and the customer's storage area also is of primary importance. Excessive charges anywhere enroute may well cause the customer to turn a cold shoulder. The chill will be felt all the way back to the production face.

The customer himself, if only in the interest of insuring his own unfailing supply of fuel, must expect to pay a reasonable price for a product of value. There is self-protection for large consumers in laying realistic purchasing policies before their suppliers.

The upshot is that an unwarranted raid on the proceeds by any of the parties cannot be tolerated by the others who also hope for their rightful return on coal's growth.

In a wider sense, the interests of the public also enter the picture. In planning for peaceful uses of coal all stewards of the industry, acting in a free economy, must set their sights on producing a higher standard of living for all the people, as measured in products and services, such as, electric power, steel, steam, aluminum and chemicals. Coal will provide these material elements of the better life in direct return for the patience exercised in its development.



MASSIVE COAL DUMPINGS at Hampton Roads, Va., in January, 1956—greater than any other month in history—

Here are on-the-spot reports from McGraw-Hill World News correspondents in the 21 principal overseas coal markets. Their findings, based primarily on personal interviews with official government and trade sources, point to this conclusion:

Exports are no flash in the pan . . .

U. S. Coal Props World Prosperity

A MINIMUM 38-MILLION TON MARKET for U. S. overseas coal, up 4 million tons over 1955: that's a near-certainty in 1956 and the probable firm export tonnage (excluding Canada) for the next 5 yr. Here's why:

World prosperity and industrial expansion show signs of leveling off in 1956. But McGraw-Hill economists (p 57) surveying the outlook in West Europe—the major area market for

hit more than 4.2 million tons.

By W. A. RALEIGH, JR.
Assistant Editor, COAL AGE

U. S. coal—say that prosperity there is not likely to drop below the 1956 level during the forseeable future.

They add: "American coal, in substantial quantities, will continue to be not only welcome in Europe but absolutely indispensable for achieving desired growth rates." What happens to U. S. coal exports in 1956, therefore, should set the pace for the immediate years ahead.

The reports following show that nearly all of the 21 principal overseas markets in West Europe, the Far East and South America will need as much U. S. coal in 1956 as in 1955. Many countries will be forced to buy more from the U. S. due to (1) drastic cuts in tonnages received from the usual sources of supply—Great Britain and West Germany—and (2) Poland's inability to take up the slack (p 59).

Also in the picture, demands for coal in Great Britain and West Germany have so outstripped the growth of their native production that both will continue as major importers of U. S. coal.

This fact—the emergence of Great Britain and West Germany as major markets—plus greater exports to other countries resulting from the dislocation of West Germany and Great Britain in world coal trade, adds up to a near-certain increase in U. S. coal shipments of 4 million tons in 1956.

The permanency of the 38-million ton export market is not seriously challenged by any upsurge in the consumption of oil, gas and hydro-power. Their contributions to rising energy needs will be considerable. But they will not generally affect coal's solid future overseas which is based primarily on the huge demand for coking coals to feed the rapid expansion in world iron and steel production.

Even in Great Britain, where the main market is in steam-raising coals, informed observers see the cost of converting power plants from coal to oil as a strong, if not prohibitive, brake on a major jump in the country's oil-fueled power.

Greater quantities of nuclear power will no doubt be made available sooner in overseas countries than in the U. S. but no serious competition is in view for the next 5 to 10 yr. And in Great Britain where nuclear power is being pushed most rapidly, a noted authority on the country's long-range energy outlook predicts that the fullest realization of the present nuclear program will still leave an energy gap as late as 1975.

The potential for U. S. coal overseas could go well beyond the probable firm 38-million ton market—possibly reaching a new record of 45 million tons before 1960—if demand always matched ability to buy. Dollar shortages and the reluctance to bear the brunt of high freight costs will cut into this potential.

But a large measure of the doubtful potential might be realized—and the probable firm 38-million ton market made solidly firm—if U. S. coal companies will take the bull by the horns and aggressively promote the export trade. This means:

1. Planning on the export market as a permanent part of the total sales picture. Bear in mind that many U. S. industrial concerns have found that a 5 to 10% quota earmarked for export can spell the difference between profit and loss in total operations. And don't underestimate the size of the 5-yr export market—$1.1 billion (38 million tons annually at a rough average of $6 per ton f.o.b. mine basis).

2. Organizing to reduce high ocean freight costs—the most sensitive point among overseas buyers of U. S. coal. Here, the answer might be the shipping pool to ensure more bottoms, thus protecting the customer from the price ravages of competitive cargo space and from excessive port storage fees. Italian shipping interests have already taken the lead on this score with the reported construction of huge 22,000-ton freighters planned for service in the U. S. coal trade.

3. Reserving a variety of good stock for export. Overseas customers have strong preferences for the variety and quality of U. S. coals, particularly when they have to pay nearly as much, or more for inferior grades of Polish coal.

I. Western Europe

Geneva Roundup

Behind the zooming market for U. S. coal in Western Europe is this central fact: **Demand for energy has been increasing during the last 2 yr at an average rate of slightly over 6% annually. The average volume increase in energy consumption from the winter 1952-53 to the summer 1955 amounted to about 34 million metric tons annually of hard-coal equivalent. Solid fuels contributed 17 million tons or one-half, while the rest was made up of black oils, 10 million tons and hydroelectricity, 7 million tons.**

Although accounting for most of the volume increase in energy consumption, solid fuels' share of the total energy market declined by 3.2% from 75.9% in the winter 1952-53 to 72.7% in the summer 1955. At the same time, black oils and hydroelectricity upped their shares by 2.5% and 0.7% respectively, to 12.8% and 14.5%.

Solid Fuels—The consumption of solid fuels in Western Europe rose from 412.2 million tons in the period Oct. 1, 1952 to September 30, 1953, to 421.9 million tons in the corresponding period of 1953-54, and to 444.3 million tons in 1954-55. Nearly half of the additional tonnages of solid fuels was absorbed by the growing requirements of the iron and steel industry.

Taken individually, the solid fuel

OCEAN FREIGHT COSTS must be held firm to keep export coal market at present high level.

consumption of European countries showed wide variations. Relatively large increases were recorded in Austria, Denmark, Finland, Greece, Switzerland and Yugoslavia, while France, Ireland, Norway and the United Kingdom were below the average. In Portugal and Sweden there was a decrease during this period.

Considered globally, deliveries of raw coal for conversion into electricity, gas and coke have increased more than total deliveries of coal. In those uses where coal is burned as such, demand for supplies has remained stable or practically unchanged, showing the effects of competition from oil producers and refiners.

Black Oils and Natural Gas—In Western Europe, the consumption of black oils and natural gas rose from a total of 55.7 million tons of hard-coal equivalent in the period Oct. 1, 1952, to Sept. 30, 1953, to 78.3 million tons in the corresponding period of 1954-55. This rapid expansion, 20% annually, was largely due to the adoption of new policies by the two main coal producers, Western Germany and the United Kingdom.

To minimize the risks of a chronic coal shortage, the United Kingdom has recently adopted a policy of encouraging the use of oil to supplement coal. Although the full effects of this are yet to be felt, industrial consumers, inspired by the possibilities of a coal shortage and a net price movement in favor of oil, have reacted to this policy change. These developments increased oil consumption by 2.3 million tons hard-coal equivalent between October, 1954 and September, 1955.

In Germany, the use of liquid fuels has been encouraged by fiscal measures. Duties on heavy oils imported for heating purposes in cokeries and gas works were reduced in September, 1955. All duties on heavy oils used for navigation purposes on the Rhine were rescinded. And duties on heating oils were substantially reduced in March, 1954. Such steps increased oil consumption from 5.6 million tons hard-

coal equivalent, in the period October, 1953, to September, 1954, to 7.8 million tons in the corresponding period of 1954-55.

Hydroelectricity — Production increased 6.9 billion kwhr, or 5%, in the period October 1, 1953 to September 30, 1954, compared to the corresponding previous period. A bigger jump of 15.7 billion kwhr, or 13% occurred between the winter 1954-55 and the summer 1955, bringing the total to 147 billion kwhr. This uneven development in hydro-power was due to unfavorable hydraulic conditions rather than to changes in installed capacity. In the same period, installed capacity increased at an annual rate of 7%, a somewhat lower rate than in earlier postwar years when the increase was equivalent to about 10%. It is now expected to average slightly below 6% in Western Europe during the 1953 to 1958 period.

The amount of coal that has been replaced owing to improved hydraulic conditions in the period winter 1954-55 to summer 1955, compared to the corresponding previous period, is put at about 5 million tons.

Present hydraulic conditions are as a whole satisfactory in the Scandinavian countries, where an extremely dry summer has caused much concern.

The International Coal Trade—The growth in the volume of coal and coke trading, which had started during the latter half of 1954, was developed and maintained in the summer of 1955, when the total tonnage imported by Western Europe reached 49.3 million tons, i.e., 11.4 million tons, or 30% above that of the previous summer. With the area's exports up only 2.1 million tons, the net increase in imports amounted to 9.3 million tons.

Despite the fact that both west and east European exporters responded to the widening gap between production and demand in Western Europe, a grave shortage was only avoided by massive imports from the United States. These amounted to about 47% of the area's total imports.

Figures made available by the High Authority of the European Coal and Steel Community also reflect the situa-

Glossary

The metric ton is used throughout written, and tabular matter (pp. 60, 61).

A long ton (2,240 lb) is 35.4 lb heavier than, or 1.016 times, a metric ton (2,204.6 lb.)

Hard coal includes bituminous and anthracite.

Forecast On West Europe

West Europe's industrial production has been rising phenomenally: 8% in 1953 and 10% in 1954 and in 1955. Main factors have been the absorption of about a million German unemployed, and productivity pay-offs from large-scale postwar investment programs —partly financed with Marshall Aid.

From 1955-60 the rate of advance will inevitably be slower. Manpower and resources are now stretched pretty tight. Unemployment is generally below 4%, with Italy a notable exception. The soaring demand for raw materials is putting pressure on prices. Adequate power supplies are increasingly a problem. And the tendency of imports to outrun exports has created actual or prospective foreign exchange difficulties in several countries.

To check inflation and conserve foreign exchange, there has been widespread resort to tight-money policies. These have been effective enough to check speculative excesses. The fear that they will overshoot the mark and trigger a recession seems unduly pessimistic: they can easily be relaxed when desired. And most European governments won't mind running budget deficits, if and when needed to sustain demand.

Continuing prosperity, therefore, means small danger of a serious letdown in Europe. Barring international complications or serious power shortages, you can count on an average industrial growth of 5 to 8%—reflecting population increases, higher productivity from new investment, and continuing shifts of resources from agriculture and services into industry.

Adequate power supplies may be the chief problem. West German coal output is as stagnating as the British. Hydro resources of the region are already largely utilized, and yearly additions can fill only a small part of growing total power requirements. Even with the expected rapid buildup of refineries, there's little prospect of increasing capacity fast enough to keep pace with need for industrial fuels. And the whole oil program rests on the increasingly precarious base of Middle-East politics. Nuclear power supplies the probable long-run solution, but won't significantly affect the situation in the next 5 yr. It looks as though American coal, in substantial quantities, will continue to be not only welcome in Europe, but absolutely indispensable for achieving desired growth rates.

Note, in this connection, that even if tight-money policies seriously pinch European imports, especially dollar imports, this will *not* seriously affect imports of American coal. The primary purpose of such credit-tightening is to reduce consumer demand for manufactured imports, especially of American goods. It won't be intended or permitted to choke off continued expansion of basic industry. And, so far as one can see now, that expansion will depend heavily on American coal for some time to come.

There's a theoretical possibility of stepping up shipments of Silesian and other East-European coal to West Europe in the event of a major relaxation of East-West tensions. Such relaxation seems, however, still far off; nor is it clear that the satellites with their own rapidly growing industrial requirements, would in fact be able to develop any large export surplus.

Now a side-glance at some of the individual countries:

The U. K. is riding the crest of business confidence. It looks now as if the money-squeeze *will* curb demand enough to check the drain on reserves, and permit continued if slower expansion next year.

The French economic outlook is dominated to a frightening extent, by political uncertainties—especially in North Africa. Declining American aid, a big budget deficit, and rising wages, spell inflationary pressure in any case, and a probable end to 3 yr of relative price stability. Industrial production will rise, but not by last year's 10%.

West Germany also looks for higher costs, as workers demand a larger cut out of industrial profits. Here imports, including dollar imports, seem actually likely to accelerate.

Italy straining to build up its own "underdeveloped area" in the south may have to slow down a bit despite nearly 2 million still unemployed.

In Holland, Norway and Sweden the chief problems, as in Britain, are overemployment, climbing wage-rates, and excess consumption, particularly of imports. But there's no reason to think that the British solution won't work here, too.

Belgium, Switzerland, Denmark and Austria seem likely to do particularly well in the next few years.

McGraw-Hill Economics Department

tion. Total imports by the Community—including Germany, Belgium, Luxembourg, France, Holland and Italy—ran at nearly 1.8 million tons per month in 1955, up 50% over 1954. Imports from the United States moved up in 1955 to 1,135,000 tons monthly (for the first 10 mo) from a 1954 average of 447,000 tons, thus accounting for the entire increase in imports from sources outside the community. Coal stocks were reported down drastically, standing at 8 million tons on December 1, 1955. Of this stock, 6.5 million tons is in the hands of the French mines. Only 1 million tons of the stock is considered merchantable.

Both West Germany and the United Kingdom—the two principal exporting countries in West Europe—became net importers during 1955's 6-month summer season. West Germany imported 1.8 million tons more coal than it exported. The cut in West Germany exports was felt most severely by Austria, whose imports of coal from that source dropped from 950,000 tons in the summer 1954 to 555,000 ton in 1955.

Contributing partly to closing the gap between production and demand in Western Europe, Belgium, France and the Saar increased their exports slightly during the 1955–6 mo–summer season. Also, imports from Eastern Europe and the Soviet Union for the same period rose to 4.5 million tons, compared with 3.4 million tons during the corresponding 1954 period.

Production Outlook—Investment programs of the six European Coal and Steel Community countries show that an output of 260 million tons can be attained in 1958. Their combined output totaled 242 million tons in 1954, indicating that they were planning an annual increase of about 5 million tons, more than half of which should be in coking coals.

By country, official forecasts for 1958 production of hard coals are: Belgium, 30 million tons; France, 57 million tons; Saar, 18 million tons; Western Germany, 142 million tons; and the Netherlands, 12 million tons.

In the United Kingdom, the most recent revision of the Coal Board's National Plan (January, 1955) aims at an output of about 254 million metric tons by 1965, but considerable efforts will have to be made to reach this goal, if present output trends can be a guide. The biggest obstacle is manpower, which is now declining at a rate of over 5,000 a year.

Since the iron and steel industry consumes about 17 to 18% of the hard coal distributed in Western Europe, this industry's activity will tip the balance between surplus and shortage in the coal market. At the present time, iron and steel output is fairly high, and increasing. Estimates for 1956 production in the area are: Pig-iron, 60.4 million tons (1955, 56.7 million tons); and steel, 81.6 million tons (1955, 77.3 million tons). These figures are large enough to provoke some anxiety concerning the availabilities of coking coal. They indicate that up to 6 million tons more of coking coal may be needed in 1956 than in 1955.

Summing up the coal situation in Western Europe, McGraw-Hill's World News correspondent in Brussels puts it this way:

"The demand for coal is settling into a faster phase than the growth in supply. This means that there will probably be quite a material market for U. S. coal for some time to come. On the other hand," he adds, "with current buying from the U. S. already not far short of the 1951 level, one has to fear the appearance of a rise in freights which would result in delivered prices being so high as to play havoc with the European economy.

"The long-sighted view of the problem might be to teach the Europeans to use enough of their coal as coking coal, and to concentrate on selling the other sorts, largely steam coal and to a lesser extent, gas coal, to the coastal markets left unsupplied by Great Britain. These, of course, include the Italian market which the Community countries have recently been rather proud of supplying, even at the cost of subsidizing the Belgians to do so."

Great Britain

In 1955, Great Britain's imports skyrocketed 283% over 1954. Meanwhile, exports rose only 11%. Of the import increase—8.6 million metric tons—the U. S. supplied more than half, or 4.8 million tons.

The tremendous shift to imports and the startling jump in purchases from the U. S.—ten times greater than in 1954—brought into focus these main questions:

1. Was Britain, long one of the world's chief coal exporters, on the way to becoming a permanent net importer of coal and what effects would this have on world coal trade?

2. Would imports from the U. S. increase, decrease or remain about the same as in 1955?

There are no pat answers to these questions. But this much seems quite clear: As long as the industrial boom continues in Great Britain, as long as local production remains stymied, and as long as alternative fuels are either equally high-priced or unfitted to do coal's jobs, the country will have to import more coal than it exports.

Although the Ministry of Fuel & Power announced intentions to cut 1956 coal imports by 5 million tons and import equivalent amounts of oil, informed observers expect the plan will not work out in practice. The London *Financial Times*, for example, looks for imports to continue at about 1 million tons a month. And the UN's Economic Commission for Europe, usually conservative, estimates that Great Britain will have to buy 10 million tons of coal in the summer of 1956 and the winter 1956-57.

More likely to occur is the British Government's announced intention to cut coal exports by 5 million tons in 1956. Such a cutback would free enough British coal to meet the projected increase in 1956 demand. Meanwhile, however, Continental markets—traditional outlets for British coal—will be forced to up their demands for West German and Polish coals which are already faced with export limits. And, in this vicious circle, Great Britain will be left with little choice but to continue its 1955 level of coal purchases from the U. S. at least through 1956, and quite probably at this level or higher in the immediate years following.

Behind Great Britain's coal dilemma are these two knotty problems: (1) labor for the mines is becoming critically scarce, declining at a rate of 5,000 men per year, and (2) coal is getting harder and harder to reach. New mines reach depths of from 2,000 ft to 4,000 ft. The best ones are largely exhausted. This means higher extraction costs and a heavy investment in mining equipment, which the industry is not geared to support. As a result, the British expect no quick increase in coal production and any future increases in output can only result in higher prices.

In its present coal dilemma, Great Britain, of course, has turned with vigor and foresight to alternative fuels. Greater use of oil, though being encouraged now, does not fulfill the search for a long-range fuel. Hydropower can save a maximum of only 2 million tons of coal by 1970. Nuclear energy, however, appears the final answer since eventually it is expected to provide a fuel for power, virtually unlimited in quantity and comparable in cost to conventional fuels.

The present nuclear program calls for replacing 6 million tons of coal by 1965 and 40 million tons by 1975. And there is little doubt that Great Britain will have larger quantities of nuclear power sooner than any other country of the world. But there is this final enigma to the long-range energy

outlook: Even with the fullest realization of the present nuclear program, a noted British authority sees a considerable energy deficit. Conceivably, U. S. coals could fill the gap if prices are kept sufficiently attractive.

West Germany

Based on part-year data, West Germany imported about 16 million metric tons of coal in 1955. Officially, little change is expected either in types or quantities of coal imported in 1956. However, reliable authority indicates that total imports could rise to 19 million tons for that year, possibly to 22 million tons in 1960 and to 28 million tons in 1965. **If the United Kingdom cuts exports further in 1956, any deficit occurring in German import needs will have to be met by the U. S., which shipped about 6.2 million tons to the country in 1955.**

Ninety per cent of all coal in short supply will undoubtedly be coking coal. The UN's Economic Commission for Europe estimated Western Germany's coal imports from the U. S. at 1.8 million tons for the last quarter of 1955. This indicated a possible market of 7 million tons in 1956. In addition to the U. S., West Germany also imports from Poland, the USSR, France and the Netherlands.

Ruhr officials hint that, if U. S. freight rates rise further, Germany may increase imports of relatively expensive Polish coal. Bonn officials are cautious, but it seems that the Russians are offering substantial quantities of coal under a Russian-German trade agreement which will probably be negotiated in the near future.

West Germany's production of bituminous rose from 122 million tons in 1954 to 125 million tons in 1955. By 1960, output is scheduled to reach 135 million tons, and by 1965, 145 million tons. Anthracite production is expected to advance only slightly from 6 million tons in 1955 to 6.7 million tons in 1960, and to 7.5 million tons in 1965; in the same years, successively, brown coal-lignite should jump from 90 million tons, to 110 million tons, to 130 million tons.

With an eye to easing the problem of recurrent labor shortages, the Bonn Government has presented legislation to Parliament, which will allow skilled coal miners and steel workers from other ECSC countries to work in West Germany without restriction. In 1954, ECSC member states recommended such legislation.

France

All types of coal are short in France, particularly coking coal for a rapidly expanding steel industry. Import needs for 1956 are: coke and coking fines, probably 6 million metric tons; anthracite, probably 1.5 million tons; and other bituminous, 10 million tons.

If there is a coal deficit in future years, imports are expected to come primarily from other members of the Coal and Steel Community. Great Britain, Poland, the USSR and Morocco will also contribute in varying amounts depending on the supply situation in those countries and on general trade relations.

In general, U. S. coal will be imported only as a last resort, because of high freight costs. However, U. S. coals, especially coking coal, will undoubtedly be required for some years to come. And last-resort ordering meant about 1.5 million tons of U. S. coal in 1955, compared to 54,000 tons in 1954.

During 1955, France imported an estimated total of 17.2 million tons of coal including 9.8 million tons of bituminous; 1.5 million tons of anthracite; 4.9 million tons of coke; and 1 million tons of briquets and other solid fuel. By 1960, imports might jump to 25 million tons and by 1965, to 34 million tons, including 8 million tons and 10 million tons of coke for those respective years.

McGraw-Hill's World News correspondent in Paris cautions:

"The 1960 estimates are pretty flimsy, the 1965 are strictly out of the hat. They depend on (1) a general estimate of industrial production which can only be a hopeful guess, (2) on a continuation of the current policy of coal vs. petroleum, and (3) on the supply being available from somewhere. If the somewhere is as far away as the United States and freight rates are high, they could easily be modified downward.

"The coke projections are based on a 50% increase in steel production during the next 10 yr. This could be optimistic. It could also be a little wrong if the French do what they say they are going to do—produce more usable coke from poorer coal."

Netherlands

The Netherlands looks more and more to the United States for coal and here's why: Local production and imports from other Western European countries fail to meet growing needs for coke and electric power.

Total imports from all countries in 1956 may run to about 9 million metric tons; by 1960 they could reach 11 million tons, by 1965, 14 million.

Dutch importers are concerned over the high delivered price of U. S. coal.

(Continued on p 61)

Who Will Get The Cream — Poland or The U. S.?

With Great Britain and West Germany cutting their exports drastically, Polish coal offers the stiffest competition to U. S. coal for the deficit or extra demand in West Europe. Whether the U. S. or Poland gets more of this "cream" will depend on which country is best able and willing to increase its exporting capacity and to deliver quality coal at a fair price. Based on these criteria, Polish competition for the "cream-market" could be weakening.

Labor problems have hamstrung efforts to step up output. Although the Poles have upped production three and one-half times over 1945, the industry failed by 6 million tons to meet the 100-million-ton-hard-coal output target set for 1955. This failure is due mostly to fluctuations in the number of miners, absenteeism, alcoholism and careless working. Roughly 230,000 miners were needed for the 1955-target output; only about 200,000 were available.

Total Polish coal exports have dropped at the rate of about 1 million tons a year since 1952. Shipments in 1955 were about 27 million tons; in 1952, they hit 30.5 million tons.

The country's export tonnage to East Europe—about half of total exports—is increasing. With export capacity declining, this could only mean less coal for West Europe.

Evidence mounts that the Poles are gouging their export customers. Poland can now sell her coal (mostly inferior grades) either at the European delivery price of U. S. coal or just slightly below. Finland and Denmark report that the price of Polish coal is higher than that of U. S. delivered coal.

The upshot of the aggressive Polish price policy is this: Their customers have started to seek new sources of supply. Italy, a big buyer in some postwar years, plans practically no purchases from Poland in 1956. A 500-million ton market is said to be open for less expensive suppliers in Denmark. Even in far off Argentina, importers wonder why they should buy inferior Polish coal at $23 a ton, when high-quality U. S. coal can be bought at $17.

What does the Polish coal pictur add up to? It means that U. S. coal exporters have a teriffic opportunity to sell the "cream-market" in international coal trade, and perhaps also to take over at least parts of Poland's existing markets. But, American exporters must hold to a fair delivered price and avoid the Polish pitfall—pushing the customer too far.

21 Overseas Targets

		CONSUMPTION—COAL (in thousands of tons)						CONSUMPTION—OTHER FUELS (in thousands of tons of coal equivalent)			EXPORTS—COAL (in thousands of tons)					
		Hard Coal	Bituminous	Anthracite	Brown Coal-Lignite	Coke	Briquets & Other S.F.	Fuel & Other Heating Oil	Natural Gas	Water Power	Hard Coal	Bituminous	Anthracite	Brown Coal-Lignite	Coke	Briquets & Other S.F.
EUROPE																
Gt. Britain	'54		216,916			27,870	1,510	10,800[1]		1,250		16,560			1,219	244
	'55		217,830			29,756	1,524	13,100		1,130		14,732			1,219	258
Belgium-Lux.[1]	'54		14,544	12,043	228	9,487	1,087	3,910		70		3,110	2,490		890	320
	'55		15,200	12,365	250	10,130	1,110	3,460		110		4,140	3,000		740	430
Denmark	'54	4,380				1,811	507	1,727		161						
	'55	4,555				1,889	228	2,023		160						
	'60	6,100				1,970		2,090		169						
	'65	6,200				2,010		2,160		173						
France	'54		37,100	6,500	1,300	15,400	6,750	12,846	350	19,400		4,120			82	
	'55		38,700	6,700	1,300	18,200	6,100	13,875	360	20,000		6,000			200	
	'60		45,000	7,000	1,300	22,000	6,000		1,000	24,000		6,000			500	
	'65		55,000	7,000	1,300	27,000	6,000		1,500	30,400		6,000			500	
Germany	'54	130,000			88,500	27,000	29,500	5,600	180	5,420	16,490			81	9,644	2,123
	'55	134,000			91,000	30,000	30,500	7,800	350	7,390	12,500			24	11,000	2,180
	'60	149,000			110,000	34,500	33,000									
	'65	165,000			130,000	40,000	36,000									
Italy	'54		8,200	735	1,710	3,654	17	11,410	4,395	18,887		2.7	0.5			
	'55		8,887	1,098	1,595	3,976	18	12,600	5,400	19,600		3.1	0.6			
	'60		11,995	1,529	2,150	5,150	50	20,000	11,000	23,500		5	1			
	'65		14,995	1,799	2,350	6,200	100	26,000	16,000	26,000		5	1			
Netherlands	'54	18,000			50	3,155	1,475	1,695	85		1,059			2	1,538	155
	'55	18,600			50	3,275	1,675	2,175	125		875			2	1,850	210
	'60							8,500	300							
	'65							10,000	500							
Norway	'54	888				432	6	2,090	12,470			136				
	'55	842				520	6	2,460	13,230			130				
Portugal	'54							730	890							
	'55	776						810	950							
	'60								1,055							
Spain	'54		11,668	2,189	1,725	1,184	1,078	1,870	6,272			12	60			
	'55		11,780	2,257	1,869	1,394	1,078	2,860	6,700			12			3-6	
	'60		14,585	2,809	3,222	2,670	1,078	3,920	10,800							
	'65			3,300					14,800							
Sweden	'54	2,527				3,028		7,000		13,410						
	'55	2,480				3,398		8,080		13,880						
Switzerland	'54	1,887			1	661	250	1,540		6,500						
	'55	1,880				530	426	1,840		7,880						
Yugoslavia	'54		1,530		12,576	647		740	110	980		11		98		79
	'55							740	90	1,420						
Austria	'54	4,033			5,982	2,123	512	1,460	400	4,110			19			
	'55	4,223			6,286	2,222	551	1,580		4,850						
Finland	'54		1,900	100	30	550	20	350	3,900							
	'55		1,900	150	30	550	20	530	5,000							
Greece	'54	220				15		1,180								
	'55	225						1,290								
ASIA																
Japan	'54		43,573	1,650	1,392	6,535	2,465	14,530	164	30,818		291			8	
	'55		46,667	1,675	1,400	7,315	2,640	15,737	192	32,610		300			20	
	'60		52,377	2,010	1,500	8,840	3,150	21,030	467	46,821		300			20	
Korea	'54		1,300	878		2	4	70		410			62			
	'55		1,232	1,293		2	9	74		384			32			
	'60		419	4,333												
SOUTH AMERICA																
Argentina	'54		1,409	14		46		15,000	887	140						
	'55		1,310			111										
	'60		3,680			200										
	'65		4,250			250										
Brazil	'54		2,435			457		3,070	2,520	9,440						
	'55		2,727					3,588	2,520							
	'60															
Chile	'54		2,018		208	400		3,100		3,200					10	
	'55		1,987		223	370		3,300		2,450		57			10	
	'60		2,900		300	475	50	4,130	300	3,650						
	'65		3,200		400	550	100	5,100	500	5,500						

Most 1955 figures are estimates based on part-year data. HARD COAL includes bituminous and anthracite. Due to differences in statistical reporting methods, figures from one country to another may not always be directly comparable. This particularly applies to "Consumption—Other Fuels" in terms of coal-equivalent tons, where conversion formulae may vary.

[1] Includes gas, and diesel and fuel oil.

For U. S. Coal

IMPORTS—COAL (in thousands of tons)						LOCAL PRODUCTION—COAL (in thousands of tons)				
Hard Coal	Bituminous	Anthracite	Brown Coal-Lignite	Coke	Briquets & Other S.F.	Hard Coal	Bituminous	Anthracite	Brown Coal-Lignite	Coke
	3,048					227,888				30,656
	11,684					224,231				31,538
	2,654	1,352	218	4,157	47		14,760	14,450		6,198
	2,290	1,615	250	4,820	60		15,300	14,200		6,666
4,380				1,811	597					416
4,555				1,889	228					422
6,100				1,970						
6,200				2,010						
	8,950	1,450		3,818	990	54,405			1,911	11,661
	9,800	1,500		4,941	1,000	55,500			2,000	13,746
	13,000	2,000		8,000	1,000	60,000			2,500	
	21,000	2,000		10,000	1,000	65,000			3,000	
8,323			936	267	2,299		122,160	5,875	87,813	39,477
11,562			1,348	260	2,508		124,500	6,000	90,000	44,218
							135,000	6,700	110,000	
							145,000	7,500	130,000	
	8,203	672	62	39	17			64	1,648	3,634
	8,900	1,050	55	61	18			49	1,540	3,852
	12,000	1,500	50	100	50			30	2,100	
	15,000	1,800	50	100	100				2,300	
7,018			76	360	577	12,071			173	
7,700			15	400	750	11,800			225	
968				382	5					
940				474	6					
452				19	2	432				
436				15	5	416				
964				130	18		10,700	2,189	1,725	
532				71	18		11,800	2,210		
800					18		13,700	2,800	3,200	
					18					
3,024				2,064	166				300	
3,200				2,500	175					
1,887				661	250					
1,880				530	426					
553	62			217			988		12,675	428
							1,087		13,728	696
3,843			193	391	526	177		6,285		1,809
4,076			176	402	478	175		6,580		1,818
	1,900	100	30	550	20					
	1,900	150	30	550	20					
220				15						33
				6						36
	57	406		2,641			42,913	1,558	1,393	
		366		2,804			43,000	1,650	1,400	
		327		2,910			49,000		1,500	
	1,269				4			879		
	1,193				9			1,293		
	419							4,333		
	1,397			46			120			
	1,298			111			120			
	3,500			130			180			
	4,000			180			250			
	907						2,055			
	1,092						2,327			
							3,000			
	139						2,033		253	415
	142						2,450		175	380
	286						2,600		300	455
	355						2,850			520

(1) Belgium-Lux. coal consumption and import figures include, for Luxembourg, in 1954 and 1955, respectively, in 000's tons bituminous, 204 and 240; anthracite, 82 and 85; coke, 4,047 and 4,600; and briquets, etc., 7 and 10. Luxembourg does not produce or export coal.

If freight rates continue to push this price higher, some observers see a serious impact on the general price structure of the country.

In spite of high prices, the Netherlands bought an estimated 4.4 million tons of bituminous from the U. S. in 1955, up 120% over the previous year. Anthracite purchases – heavier than any other U. S. overseas outlet– climbed 54% from 154,000 to 236,000 tons.

No difficulties have yet been experienced in obtaining enough coal. However, stocks during the current winter are lower than in the winter 1954-55. Coke production rose by 300,000 tons, compared to the previous year.

On the competitive scene, fuel oil consumption moved upwards in the industrial field. No important projects are underway for further development of hydro-power, oil refining or natural gas.

Belgium-Luxembourg

Belgium should buy at least a million tons of U. S. coal in 1956. The country imported a total of about 3.5 million tons in 1955.

"Extra" demand for U. S. coal in the years ahead is dependent on:

1. The duration and extent of the present "super-boom" in steel output.

2. The ability of Belgian mines to increase production.

3. The availability of coal from usual sources of import—other West European countries, especially West Germany and Great Britain. Supplies from Great Britain (for coastal areas) and Germany have already dropped off.

All types of coal are in short supply, but particularly coking coal to fill the needs of the steel boom. Although the boom will probably go on through most of 1956, Belgian authorities do not consider it permanent. When it ceases, they say their country will cease being a serious importer.

In 1955, Belgium produced about 15 million tons of bituminous, and about 14 million tons of anthracite.

Luxembourg imported no coal directly from the U. S. in 1955, according to latest available figures from the U. S. Department of Commerce. The reasons: the country is small, about 250,000 population; the nearest seaport, Antwerp, is considered a long overland haul; and there are no inland waterways.

Luxembourg, ranking eighth in world steel production, has no coal of her own. Ninety per cent of the coal imported comes in as coke and most

of this is supplied by West Germany. About 3.5 million tons of coke (4.5 million tons coal equivalent) will be imported in 1956.

Enough blast-furnace gas is produced to generate all the Grand Duchy's electric power. Coke is not made locally because there is no use for coke-oven gas.

The combined consumption of all types of coal (not including coke) is about 500,000 tons. Storage and handling facilities are very limited. The country could not deal, for example, with a quantity as large as a Liberty shipload. Even a 600-ton train is an effort.

Denmark

Between 6 and 6.5 million metric tons of coal were shipped to Denmark in both 1954 and 1955. The country is expected to up imports to 7.3 million tons in 1956 (5 million tons of hard coal and 2.3 million tons of coke). However, the Danish Coal Importers Association considers it possible that fuel and heating oil could displace about 1 million tons of coal in 1956.

If there is a coal deficit in future years, the U. S., Poland, the United Kingdom and ECSC countries will most likely fill the gap. The main suppliers of coal, coke and briquets are Great Britain, Poland and Germany. Smaller quantities come from the United States and from other countries. The Faroe Islands and Greenland produce enough to be entirely self-supplying.

Imports of coal from the U. S. are limited principally because of the high cost. But possible heavier purchases are in prospect. Danish importers and power groups have reacted unfavorably to the 30c to 50c jump in the f.o.b. price of British coal. As one result, they will probably seek 250,000 more tons from Poland which is already hard pressed to meet export quotas. Failure to obtain this added tonnage—on top of the 550,000 tons of usual supplies—should step up orders from the U. S. in 1956-57.

The high price of world coal has brought these other new developments:

1. If coal prices on the international market increase much more, Greenland's coal deposits may well enter the import picture. Up to now, the costs of mining and transporting this coal have been prohibitive.

2. After an interval of 10 yr, operations have started again on Danish brown-coal deposits. During World War II when fuel was in very short supply, production of this coal reached an annual peak of 2.8 million tons. The production target in 1956 is 1.2 million tons.

Norway

The United Kingdom has traditionally been Norway's supplier of coal and coke. **Owing to the present difficulties in obtaining enough coal from the U. K. and the high export prices of coal from Poland, Norway now obtains a large part of its coal from the United States. In the period, April 1, 1955, to September 30, 1955, deliveries from the U. S. amounted to about 40% of Norway's total imports.**

During the summer of 1956 and the winter of 1956-57, Norway is expected to import 1 million metric tons of hard coal and 600,000 tons of coke.

The consumption of coal dropped 4.5%, but coke use was up 60% during the 6-mo period ending September 30, 1955, compared with the same period in 1954. Due to a shortage of hydro-power (caused by the dry summer 1955) and to lower supplies of coke, no decline in coal consumption was expected during the 6-mo period ending March 31, 1956.

The increased use of coke was partly due to the end of coke rationing in the summer 1954 and to higher industrial consumption. A new steel mill has entered the picture as a relatively large coke user.

Fuel oil and hydro-power continue to be the most serious competitors for coal and coke in Norway. Fuel oil prices have remained unchanged and consumption was up 26% for the 6-mo period ending September 30, 1955. Hydro-power production jumped about 5% in 1955 over 1954, in spite of the poor water situation in southern Norway which brought a rationing of electricity on September 1, 1955. Electricity rationing leads to an increased demand for fuel oil and coke.

Sweden

Imports of U. S. hard coal for carbonizing purposes in 1956 will rise by about 250,000 tons to 625,000 tons. The increase will probably be permanent and will fill the gap left in the regular supply of coking coals from Great Britain, which has been cut from an average of 350,000 tons a year to 100,000 tons.

The head of the Swedish Coal Importers Association feels that coal for carbonizing or chemical processing offers the biggest long-range potential for U. S. coal. Nearly 1 million tons of coal are used in Sweden every year for carbonizing purposes. Within 10 yr the major share of Sweden's coal imports will be for this purpose. The need is permanent, but a definite expansion is not foreseen until coal-based chemical industries begin to expand.

Except for 300,000 tons of coal produced and consumed by one company in Sweden, all coal needs are met through imports. Total imports for 1956 are expected to hit 6.9 million tons, including 3.2 million tons of bituminous and 2.5 million tons of coke. Purchases of coal and coke for the U. S. S. R. are being upped from 50,000 tons to 150,000 tons.

Of the 2.5 million tons of oven coke consumed, only 100,000 tons are made in Sweden. All gas coke is produced locally.

Steam coal will probably be bought from European countries. However, when Polish prices get out of line, Sweden turns to U. S. coal. According to a Dec. 20 press report, the price of Polish coal was $21 a ton against $12 a ton in U. S. (large coal), but shipping and handling costs leave the price balance in Poland's favor.

Finland

With no coal resources of its own, Finland now buys 75% of its coal from Poland. In 1956, this will mean 1.4 million tons of Polish coal. The balance—400,000 to 800,000 tons—will come, in order of quantity, from the U. S. S. R., the U. S., Great Britain (coke), Belgium, West Germany and France. Bluntly, the Finnish Foreign Office states that no change is imminent in the relative importance of importing countries.

In favor of a possible expanding market for U. S. coals are these facts:

1. Official Finnish sources admit paying up to a dollar a ton more for Polish coals than other north European countries.

2. There is no difference between the cif prices of Polish coal and U. S. coal, according to local press reports.

3. Purchases from Great Britain and other West European countries are becoming more difficult.

Up to now, the Poles have gained their price advantage because the Fins have no commodity of "strategic value" to offer in their bilateral trading system. However, the growing pressure of public opinion could break Poland's grip on the Finnish market, particularly if this pressure were accompanied by greater amounts of dollar exchange.

Coal's chief competitor in industry is heavy mineral oil, the price of which encourages use on an increasing scale.

No great change has occurred recently in the capacity of hydro-power stations. Even if capacity is upped to meet the present annual 10% increase in demand, the limit of economically harnessable water power will be reached in another 10 to 15 yr.

Switzerland

The market for U. S. coal in Switzerland, small in 1955, may get bigger in the immediate years ahead. The reason: buying coal from usual sources such as Belgium and the United Kingdom is becoming increasingly difficult.

During the summer of 1956 and winter of 1956-57, the country will probably need 2 million tons of hard coal and 700,000 tons of coke. Shipments from the U. S. dropped from 240,000 tons in 1954 to 58,000 tons in 1955.

Competition between oil and coal has been strongest in the domestic sector and in some industries. The trend of prices has continued to favor oil, consumption of which moved up from 1.5 million tons of coal equivalent in 1954 to 1.8 million tons in 1955.

Expansion of hydro-power proceeds normally, at a rate of about 4% per year. In 1955, production rose to 7.9 million tons of coal equivalent, compared to 6.6 million tons in 1954.

Switzerland has no domestic coal production worthy of mention. It has to import all of its needs. The country no longer has an oil refinery.

Spain and Portugal

About 890,000 metric tons of bituminous coal will be imported by Spain in 1956—probably all for coking purposes to feed the expansion of steel plants. The U. S., Belgium, West Germany and Poland are the principal sources of supply. **In 1955, Spain's purchases of bituminous from the U. S. reached an estimated 417,000 tons, 50% ahead of the previous year; coke deliveries, about 39,000 tons, were up 10%.**

Except for coking coal, Spain is practically self-sufficient in its coal needs. Last year, the country produced and consumed between 15 and 16 million tons of non-coking coals, about three-fourths of which was bituminous.

If Portugal develops coal shortages in future years, the deficit will most likely be made up through purchases from the U. S., West Germany, Belgium and Spain. Import needs for the winter 1955-56 and the summer 1956 are: 500,000 tons of hard coal and 30,000 tons of coke.

Bituminous bought by Portugal from the U. S. in 1955 was expected to reach 89,000 tons, about double the 1954 amount.

Native hard coal production hits around 435,000 tons; brown coal-lignite, 75,000 tons.

Italy

Based on 10-mo data for 1955, Italy shared top honors with West Germany as an export market for U. S. bituminous; it was second only to the Netherlands as an overseas outlet for anthracite. Bituminous purchases for that period indicated an annual rate of 6.2 million tons, up 77% over 1954. Anthracite deliveries rose 68%, from 80,000 tons to 134,000 tons. In 1956, the Coal Committee of the Italian Ministry of Industry expects that U. S. imports will hold at least to the 1955 level. Chances are they will go higher.

Of the total 10.6-million-ton market estimated for 1956, the U. S. will account for roughly 60%. The balance will come principally from West Germany, 2.4 million tons; Great Britain, 660,000 tons; and France, 360,000 tons. Poland, a very important source for Italian coal imports in some postwar years, has faded out of the picture because of high prices.

Up to 1954, the Coal Committee was predicting a gradual drop in coal imports. This was to follow big increases coming up in the country's production of methane gas and water power, and greater consumption of foreign fuel and heating oils.

Today, the same committee looks for coal purchases to move up because (1) coke and steam power plants are expanding output rapidly, and (2) more dollars are available for coal imports.

Substantiating this view is the report that Italian shipping interests are now constructing huge coal freighters (22,000-ton capacity) for the U. S. coal trade. The first is scheduled to arrive in Hampton Roads this summer.

The predominance of U. S. coals—stemming from severe cuts in supplies from European sources—will most likely continue for some years. But a word to the wise for U. S. exporters:

Italian coke plants, gasworks and railway locomotives are designed, in most cases, for burning cheaper European coals. These consumers are now forced to mix two parts of U. S. coal with one part European coal. Over the long range, therefore, Italian authorities see big cuts in U. S. coal imports when and if European export recovers to normal—unless U. S. shipments reach the Italian market below European prices.

Italy is dependent on outside sources for all of its bituminous needs. About 45% of the bituminous imported is used by coke plants, 20% by gasworks, and 21% by the Italian State Railways. Bituminous grades suitable for these three uses are most in demand. Anthracite production, at 49,000 tons and declining, is used almost exclusively for winter heating.

Austria

Increased mutual trade between the United States and Austria is believed the basic key to higher Austrian coal purchases from the U. S. If there are more free dollars available from export earnings, more of these dollars can be used for U. S. coal imports.

In 1956, imports of coal from all countries should hit: 4.4 million metric tons of hard coal; 900,000 tons of brown coal briquettes; and 350,000 tons of coke. Of the hard coal imports, 2.4 million tons have to be of the "coke coal" quality. In the summer 1955, purchases of hard coal and brown coal briquettes from Germany fell 51% and 26%, respectively, below the previous summer.

Since not all necessary imports can be covered from European sources, U. S. coal is expected to be imported in increasing amounts. The quantity will range between 1.5 million and 2 million tons. About 1.2 million metric tons were imported from the U. S. in 1955.

U. S. coal is regarded as the "last resort" for Austrian coal consumers. But it will become critically important if deliveries from European sources—West Germany, Saar, Poland, and Czechoslovakia—do not meet Austrian requirements.

While U. S. coal is praised quality-wise by Austrian consumers, prices are considered too high. Worth noting, however, Polish and Czech negotiators adopt the U. S. coal price level in Vienna as the basis for boosting their own sales prices.

Austrian importers praise U. S. coal for the advantageous sales clauses for example, the quality guarantee. They see vastly increased U. S. exports to Austria:

1. If the delivered price can be lowered. U. S. coal being shipped to Austria has the longest freight route and it is often necessary to pay for storage at Hampton Roads harbor.

2. If a marketing and distribution system can be developed for small tonnage consumers. This would make it possible to introduce U. S. coal to

customers wanting to buy less than 10,000 tons.

3. If currency payments can be liberalized. During the fall of 1955 for example, a deal was closed whereby Austria paid in Austrian shillings for U. S. coal.

The Austrian coal industry, according to the Federal Ministry of Trade, has reached its highest possible production. Capacity is at 100% and no new mining sites are available at present.

Of the total primary energy used, coal accounts for 53%; water power, 23%; fuel and heating oil, 12%; wood, 9%; and natural gas, 3%.

Annual fuel oil output is expected to range from 750,000 to 800,000 tons of coal equivalent, depending on the size and condition of Austria's refineries. If all plans go well, Austria will up considerably its output of natural gas and hydro-power.

The Federal Ministry of Trade believes that a constant increase in primary energy can be expected. As long as economic conditions remain prosperous over the next 10 yr, the need for more coal is a certainty. While Austria plans the erection of an atomic power plant, nuclear energy will not add significantly to energy supplies in the foreseeable future.

Yugoslavia

There is a continuing annual export market in Yugoslavia for between 500,000 and 1 million metric tons of coking coal and coke.

In the summer 1956 and the winter 1956-57, Yugoslavia will import about 900,000 metric tons of hard coal and 80,000 tons of coke.

Yugoslavia has great hopes for its new method of making coke from lignite. If the method is successful, coal imports, chiefly from the U. S., will be cut by about 500,000 tons annually. According to the latest published Yugoslav reports, tests have shown that lignite-coke can be used satisfactorily at BOR (copper) and TREPCA (lead) mines, and in cement manufacture.

Although domestic coal production has jumped considerably, coal shortages persist. No real decline in imports from the U. S. is expected in the immediate years ahead, particularly since these purchases are financed by an aid program. U. S. coal exports to Yugoslavia hit an estimated 841,000 tons in 1955, up 13% over 1954.

Supplies will continue to come in from West Germany. Also, as a result of trade agreements now completed, coal shipments are due from the USSR and the Soviet satellite countries.

Yugoslav coal output reached 15 million tons in 1955, up 1.4 million tons over 1954, a local news agency has reported. New economic planning underway aims at an annual production of 19 million tons (about 1.2 bituminous, 9.2 brown coal, and 8.5 lignite). Less bituminous coal is being mined than before World War II, owing to a shortage of modern machinery, electricity and transport equipment.

Greece

U. S. shipments of bituminous to Greece in 1955 increased fivefold over 1954, from 31,000 metric tons to 185,000 tons. In the winter of 1955-56 and the summer of 1956 the country's import needs have been put at 250,000 tons of hard coal and 1,000 tons of coke. The principal sources of supply will be the U. S., the U. S. S. R. and West Germany. Greece has no domestic coal production.

II. The Far East

Japan

Coking coal and anthracite are in short supply and must be imported. During the period from April, 1955 to March, 1956, about 95% of Japan's coking coal imports are scheduled to come from the U. S. and the remainder from North China and Russian-controlled Sakhalin Island. Anthracite imports are coming from North Vietnam 67%, South Africa 15%, South Korea 13%, and India 5%. Anthracite purchases from the U. S. are negligible.

About 2.6 million metric tons of coking and 300,000 tons of anthracite coal will be imported in 1956. Purchases will be made from the same countries and in the same proportions as in the 1955-56 period above.

If there is a coal deficit in future years, coking coal imports are most likely to come from the U. S., North China, and Soviet Sakhalin. Purchases from North China may increase somewhat, depending on the status of relations between Tokyo and Peking.

Coking coal imports from the U. S. may decrease slightly if the Russians and Red Chinese agree to sell more to Japan. No American anthracite coal will be purchased. For one thing, freight from Asian countries costs far less than from the U. S. For another, Japan is not anxious to increase its unfavorable trade balance with the U. S. when this is not necessary.

In 1955, Japan supplied 81.6% of her fuel needs and the government hopes to raise this proportion to 82.8% by 1957. The chief measures planned are the nationalization of the coal industry, restrictions on the use of heavy oil, and the construction of large hydroelectric and high efficiency thermal power plants.

Oil use has been moving up at an annual rate of about 6.3 million barrels (U. S.) and total consumption was estimated at 15.7 million tons of coal equivalent in 1955.

Hydro-power has advanced from 30.8 million tons of coal equivalent in 1954 to 32.6 million tons in 1955; plans call for further increases upping the total to a possible 46.8 million tons by 1960.

Japanese coal mines are expected to up their output from 46 million tons in 1955 (43 bituminous, 1.6 anthracite, and 1.4 brown-coal lignite) to 52.5 million tons by 1960. It is hoped that this increase will cut import needs by 500,000 tons, from 3.3 million tons to 2.8 million tons.

Korea

There is no domestic production of bituminous coal in Korea; all needs must be imported. Anthracite output is below demand and the ROK Government has requested allocation of $73 million in ICA aid funds for 2.2 million metric tons of anthracite to cover shortages through 1960, when domestic anthracite production is expected to fill demand. To cut down future imports of bituminous, anthracite will be used increasingly to replace bituminous for railroad, power and other industrial uses.

About 1 million tons of bituminous coal will be imported commercially in 1956. The amount of bituminous and anthracite (if any) to be purchased with aid funds is uncertain. In addition, 48,000 tons of coal tar pitch are scheduled for import in 1956. The country will need an estimated 6,000 tons of coke in 1957.

In the past, about 90% of coal imports have come from the United States, with the remainder from Formosa. In the future, import sources will be the United States, Australia, Formosa, and possibly, India. The U. S. share is expected to drop to about 50% of total imports.

The decrease in coal imports from the United States is the result of a substantial price differential. The cif price of U. S. coal is about $33-35 a ton. Because of the short shipping distance, Formosan coal can be purchased for less than half of the U. S. price, and the ROK Government is anxious to buy as much coal as pos-

sible from nearer sources. Starting in 1956, the U. S. Government will allow Korea more latitude in procuring coal globally with ICA aid funds, instead of buying largely from the U. S.

III. South America

Argentina

The Argentine market for U. S. coal could pop right out into the open in 1956. Last year, Poland took over from Great Britain as the principal supplier of import needs. But now, a change away from the dictatorial policies of the Peron government has encouraged N. Y. banks to extend dollar credits previously denied.

A January, 1956 Associated Press release reported that two N. Y. banks had extended $30 million in credit to Argentine businessmen. Financial circles took for granted that further credit extensions would be made "very soon" by other commercial banks in the U. S.

Old-established coal importers agree that there is an acute shortage of every type of coal. Trade sources estimate that imports may reach about 1.2 million tons in 1956. This is roughly the same as in 1955, when Poland supplied 81% of the total, France 9%, Belgium 5%, Great Britain 3%, and Chile 3%. In the first 9 mo of 1955, Holland shipped 44% of the coke (17.9 million tons), Great Britain 35% (14.5 million tons), and the U. S. 21% (8.5 million tons).

Experts believe that the U. S. should become Argentina's natural supplier because U. S. coal offers higher quality and a better price. **Argentine importers have already purchased 100,000 tons of American coal for delivery in 1956.** With dollar availabilities likely to improve, why, they say, should Argentine importers be forced to buy inferior types of coal from Poland, for example, at $23 a ton, when high-quality U. S. coal can be purchased at $17 a ton?

The consumption of other fuels in Argentina, mostly domestic petroleum, is put roughly at 18 million tons of coal-equivalent. Plans call for stepping up other-fuels-consumption to 27 million tons by 1958 and to 45 million tons by 1970.

Even with increased petroleum consumption, however, Argentina will continue importing relatively large amounts of both low and high volatile coal. Imports of bituminous at 1.3 million tons in 1955, could jump to 3.5 million tons by 1960 and to 4 million tons by 1965.

Since the country has practically no domestic output, imported coal is badly needed to support ambitious industrialization plans. Railroad transport is in a most critical condition. This problem—due for priority treatment—will require more coal to feed steam locomotives. In past years, the principal importer of U. S. coal, Chadwick, Weir & Co., used to buy large tonnages of U. S. coal for sale to Argentine railroads.

Brazil

The range of types, qualities and prices of U. S. coal offer a combination that Brazilians find unequalled in world coal trade. Result: they now buy—and its almost a sure bet they will continue to buy—all their coal imports from the U. S.

Brazil's purchases of U. S. low-and high-volatile bituminous reached an estimated 1.1 million metric tons in 1955. This year they may fall to a minimum of 940,000 tons. Undisclosed amounts of anthracite will also be needed for electric furnace operations of the Mannesmann industries.

If the drop in bituminous imports occurs, it will be due to temporary dollar shortages. It is not expected to affect the country's long-range future as the top market for U. S. coal in South America. Brazil will only turn to other countries for its coal if the dollar shortage becomes absolute. This is held unlikely.

In 1955, Brazil consumed 2.7 million tons of imported and domestic coal for railways, cokemaking, city gas plants, thermoelectric plants, bunker fuel and other miscellaneous uses. The breakdown, in thousands of tons, was as follows:

	Imported	Domestic
Cokemaking	533	295
Gas plants	345	0.6
Railroads	150	772
Bunker	49	90
Thermoelectric	4	447
Other	11	31

Dr. Alvaro Abreu, assistant director of Brazil's National Coal Planning Commission, sees a potential market of 1.2 million tons for U. S. coking coals, compared to the 1955 consumption of 533,000 tons. He notes that the Nation's Volta Redonda steel plant is the only one operating a coke-feed blast furance. The potential will, therefore, be realized:

1. When some of the other blast furnaces — now charcoal-fired — are compelled to convert to coke-firing because of wood shortages that have already developed.

2. When new outlets can be developed for the middlings that would have to be marketed from mining 570,000 more tons of Santa Catarina metallurgical coal. New outlets for these middlings are needed as the use of metallurgical coal in Brazil centers around a blend of domestic Santa Catarina (30%) with imported U.S. coals (70%).

As a new outlet for Santa Catarina middlings, Dr. Abrau suggests the construction of a sizeable power plant in Santa Catarina with transmission lines delivering electricity to Sao Paulo's power-hungry market. His suggestion fits in with growing government recognition that more thermal power should accompany expanding hydro-power development.

Most of the electric power generated in Brazil is from hydro plants. They supplied 11.8-billion kwhr out of the total 13-billion kwhr generated in 1954. Only one big city, Porto Alegre, is completely dependent on thermal power.

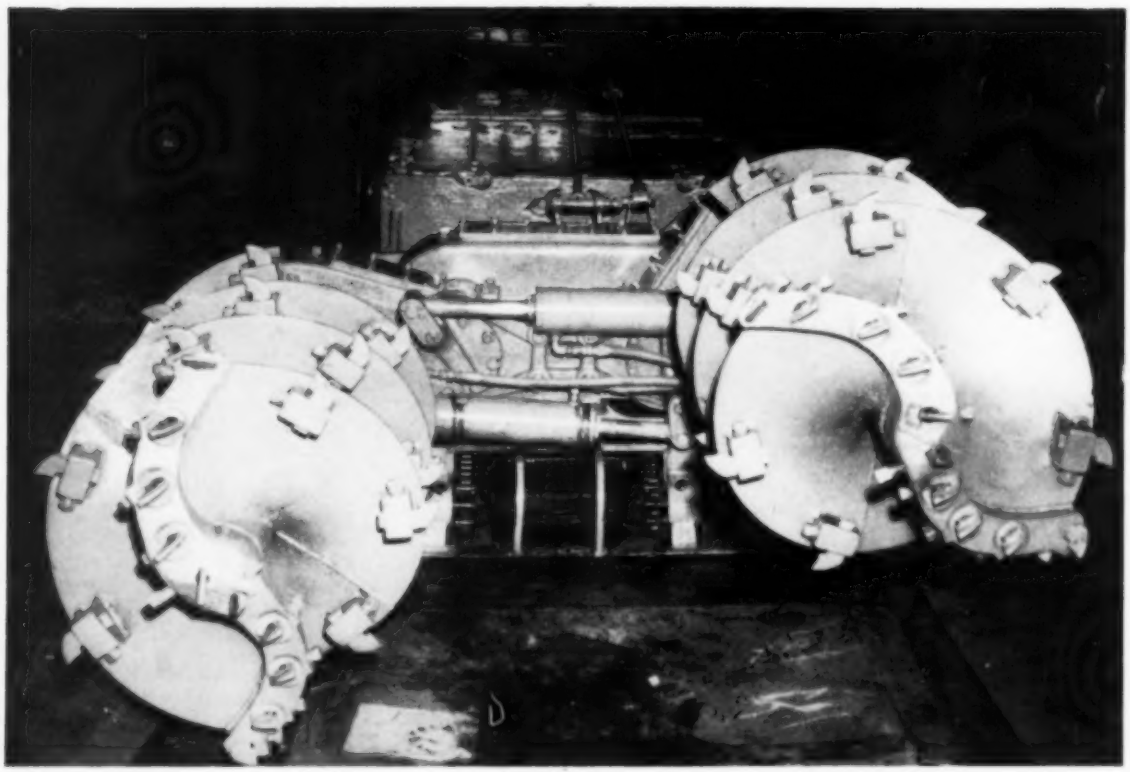
Chile

Bituminous imports by Chile dropped off from 159,000 metric tons in 1954 to 142,167 tons in 1955, according to official Chilean sources. However, long-range forecasts indicate an increasing need for more imported coal: 286,000 tons by 1960 and 355,000 tons by 1965. The country customarily imports all of its coal from the U. S.

Most in import demand are certain types of bituminous coal which have less volatile material than domestic types which average 40%. Purchases of lower-volatile types in the 20% range are needed for the production of proper steel mill coke. These purchases are expected to hit 140,000 tons in 1956.

High production costs and increasing competition from imported fuels were held responsible for a decline in the output of domestic coals during 1953 and 1954. However, recovery of domestic production appears to be well on its way. Output of bituminous jumped from 2 million tons in 1954 to 2. 5 million tons in 1955. Production planning calls for further increases to 2.6 million tons in 1960 and to 2.8 million tons in 1965.

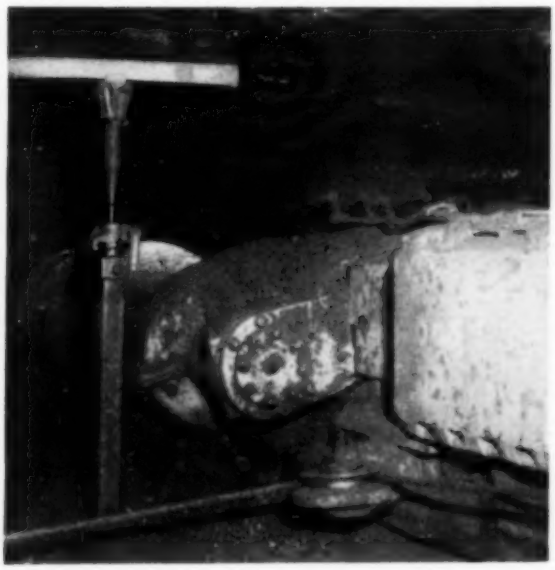
The consumption of hydro-power and fuel and heating oils is moving up quite rapidly. Informed observers look for the consumption of hydropower to rise from 2.5 million tons of coal equivalent in 1955 to 5.5 million tons in 1965. During the same decade, use of fuel and heating oil may increase from 3.3 million tons to 5.1 million tons of coal equivalent.



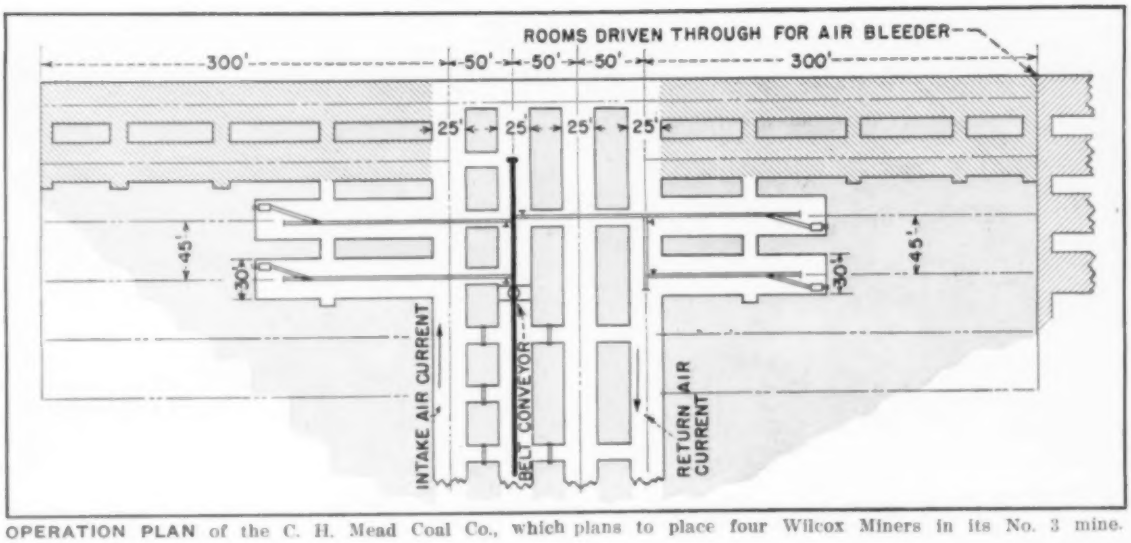
WILCOX MINER, invented by A. G. Wilcox, president of the Wilcox Coal Co., permits continuous low seam mining.

Thin Seam Continuous Mining

READY TO MOVE across the face. View here shows the distance penetrated into seam with auger sumped into coal.



CUTTING ACROSS FACE, the Wilcox permits close temporary roof support. Note water sprays and shortwall rope.



OPERATION PLAN of the C. H. Mead Coal Co., which plans to place four Wilcox Miners in its No. 3 mine.

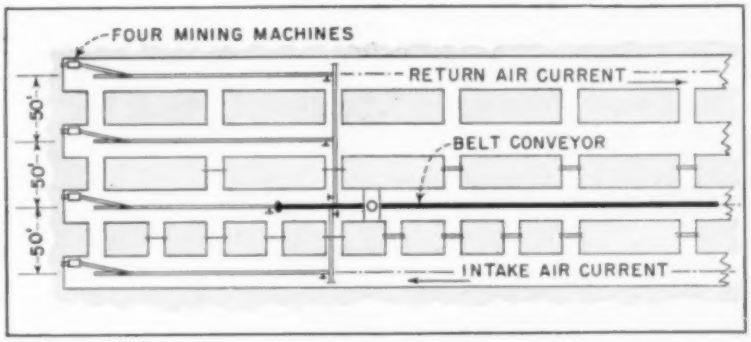
By RICHARD H. MASON
Coal Editor
Beckley Post-Herald
Beckley, W. Va.

THE WILCOX MINER—the newest development in continuous mining—has made its entrance into actual coal production, bringing with it a new concept in the field—shortwall type control of the mining machine.

Invented by A. G. Wilcox, president, Wilcox Coal Co., Shady Spring, W. Va., the machine has been declared permissible by the U. S. Bureau of Mines. The first model is producing coal now in the East Gulf No. 3 mine of C. H. Mead Coal Co. Div., North American Coal & Dock Co., East Gulf, W. Va.

Dual augers for mining, the shortwall principle of operation at the face and bridge conveyor equipment for the initial transportation stage are among the features of the Wilcox Miner. It was introduced to the coal industry about one year ago, but was not sold until exhaustive field tests in different coal seams had been held to prove the equipment and until permissibility requirements had been met.

The Wilcox machine has an overall height of 26 in. It permits the use of continuous mining methods in low seams of coal because it can be used wherever a shortwall cutter can be used. Both operate on the same principle. All previous tests indicate that the Wilcox machine will produce approximately 100 to 150 tons of clean coal per shift with a three-man crew. Actual production is bearing out the original estimates.



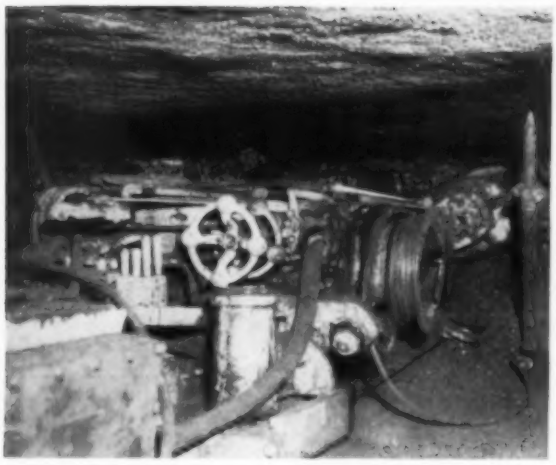
ENTRY DEVELOPMENT in Pocahontas No. 3 seam, where coal averages 36 in.

Although the Wilcox Miner does not have as high productive capacity as some of its counterparts, the simplicity of operation and maintenance is believed by the inventor to offset this disadvantage. Its lower price tag will permit a mine operator to purchase several such machines instead of one high-priced unit. Any cutting machine operator can operate the miner and any mechanic or electrician can repair it in the event of a breakdown.

The machine requires the services of three men in its operation—the operator and two helpers. The operator guides the miner and assists with temporary roof support. The two helpers, one working on each side of the machine, shovel, clean up, set screw jacks as temporary roof support, set timber, set machine jacks and apply rock dust. A foreman and a boom operator are also included in the section crew.

C. H. Mead Coal Co. plans to place four Wilcox Miners in operation in its No. 3 mine. Four machines are expected to decrease current per ton section costs. This will be possible since the section foreman and the boom operator will handle the output from all machines used on the section. After the four machines have been installed, the Mead Co. plans to have a seven-man crew working with every two Wilcox Miners. The extra man will be used as a supply and clean-up man, alternating from one machine to the other. When the four machines are in production, they will require 14 face men, one boom operator and one foreman. With this crew and four machines, it is estimated that about 18½ tons per man on the section will be obtained.

A new block of coal in the Pocahontas No. 3 seam averaging 36 in is being developed for the machines. Entries will be driven 25 ft wide on 50-ft centers with breakthroughs on the entries driven 14 ft wide. Rooms will be driven 30 ft wide on 45-ft centers. The widths of the working



CONTROLS view shows friction wheels mounted on machine's right side. Four upright levers raise, lower augers.

BRIDGE CONVEYOR and swivel dolly ride room conveyor line. Coal discharges within swivel dolly into conveyor.

places and the centers depend on roof conditions. The figures above are applicable under good conditions.

THREE BASIC ELEMENTS

Basically, the Wilcox Miner consists of three elements, all mounted on a steel plate skid base to permit shortwall manipulation at the face. The three are:

1. POWER UNIT is a Goodman 512 chassis with cutter bar removed and armature shaft extended.

2. MINING HEAD consists of augers with necessary operating gear mounted on the front of the power unit. Two augers, 42 in long, are employed for the actual mining operation. Bits around the scroll edges of each auger make them, in effect, rotary cutter bars. The auger flights also act as conveyors to move coal back to the chain conveyor under the machine. The augers, the reduction gearing that drives the augers and the hydraulic jacks for positioning the augers are mounted on slide rails at the base and oscillated, thereby controlling the particle size of the coal being mined. In operation, the miner is sumped into the seam, its augers cutting into the face to a depth of 42 in. Then it mines left to right across the face to the rib where a new cycle begins. The augers are 24 in in diameter. One rotates to the right, the other to the left. They can make cuts in either direction. (At East Gulf the coal is presently being mined moving from left to right only. The return is used for clean up purposes.) The range of face height is 26 to 40 in using 24-in diameter augers, 32 to 46 in using 30-in diameter augers.

MEAD OFFICIALS Robert A. Maurer, general manager, and James H. Hurley, mine superintendent.

3. CONVEYING EQUIPMENT includes a chain conveyor built into the machine with 15¾ in flights. It is driven by a 1¾ in pitch chain and powered by a 5-hp, enclosed, explosion-proof motor. Coal is dragged under the machine over the skid plate and is discharged from a gooseneck on to the bridge conveyor equipped with 15¾ in flights and driven by the same type chain and another 5-hp motor. At the end of the bridge conveyor, coal is discharged through an opening in the swivel dolly, which rides along the room conveyor pan and allows the bridge conveyor to ride at angles up to 90 deg.

When coal leaves the bridge conveyor at the East Gulf mine, it is discharged into a Jeffrey 61-AM, 7-in chain conveyor line. This conveyor uses a 15-hp motor that permits the conveyor to be extended to a distance of 300 to 350 ft as mining advances. The coal is discharged directly from the room conveyor over the boom into 2.2-ton mine cars. The cars are hauled about 2½ mi to a rotary dump at the bottom of the main slope, from where the coal is conveyed to the tipple.

The company, in its projections, plans to drive panel entries to a depth of 1,500 ft and to install a 30-in belt conveyor to provide panel haulage facilities. Rooms will be worked on both sides of the panel belt to 300 ft.

For roof support, 24 screw jacks are used at the face and are set 4 ft apart for a distance of 20 ft back from the face. Behind the temporary support, the permanent timbering plan practiced at the mine is followed.

Inventor Wilcox says that only a few changes were necessary to have his machine meet permissibility requirements of the U. S. Bureau of Mines. The requirements were readily met after the motors on the conveyor and on the bridge conveyor drives had been changed to explosion-proof types. Extension of the Goodman 512 power unit armature shaft did not affect the permissibility, Wilcox explains. The Goodman Mfg. Co., in fact, is cooperating with him by building a new power unit with the extended shaft.

Officials of C. H. Mead Coal Co. are: Robert A. Maurer, general manager; James Hurley, superintendent; Reed Daniels, general mine foreman; A. M. Spradling, chief engineer; W. R. Stevens, safety director; and John Calhoun, purchasing agent. Roy W. Fox, Cleveland, Ohio, is production vice-president of the company, a North American Coal Corp. subsidiary.

The Coal Commentator

Anthracite in Steel-Making

The steel industry will require about 120 million tons of iron ore per year when present expansion goals are attained, half of it, or about 60 million tons in the form of agglomerates. Anthracite fines and coke breeze can be used in the beneficiation processes. Estimates of the need for such fines revolve around a 6-million-ton per yr figure.

Another possibility for anthracite is in the increasing use of anthracite fines in coke blends. And yet another opportunity is seen in reports that anthracite egg has been tested as a direct substitute for coke in blast furnaces.

Although solid data on the tests are not available, it may be worth noting that one steel official points out that the anthracite "did no harm" in the blast furnace.

Nuclear Heat for Synthesis Gas

Tests to determine the feasibility of using nuclear heat to produce gas from coal are underway at the Bureau of Mines' Appalachian Experiment Station, Morgantown, W. Va. The tests, which do not now actually involve the use of nuclear heat, are the result of discussions between scientists of the Bureau and the AEC regarding the possibility of using nuclear heat in high-temperature chemical processes.

The Bureau's immediate interest is in gasifying coal, the necessary first step in processes for producing synthetic liquid fuels and pipeline gas. The Bureau already has an electrically-heated experimental model in use to study suitability of construction materials, heat-transfer characteristics and other process variables.

Coal on the Table

Some day it may be possible to produce all essential food requirements for man from coal and petroleum. That is the prediction of a top organic chemist, Dr. Edgar C. Britton of Midland, Mich. Dr. Britton found that a combination of eight amino acids (builders of body proteins) makes a synthetic protein, a necessity for replacing body tissues. The earth's supply of natural protein is always limited, but the scientist estimates that 1,000,000 lb of the synthetic protein could be produced each month from the fossil fuels at a cost of less than $4 per lb. That figures out to about 40c per day for proteins for the average family, which is considerably less than the cost of proteins now and the synthetic would be as nutritious as lean meat, milk and eggs.

Not to be outdone in developing dramatic uses for coal, a man in Virginia is experimenting with the use of pulverized coal as tractor fuel. And since any mention of heat catches your commentator's eye, we note that an Austrian mechanic has perfected a vending machine which heats people's feet. In freezing weather, one stands on a plate, slips in a coin and receives 15 sec of ultra-shortwave heat.

Unlimited Power Underground

There would appear to be no cause for concern on supplying adequate power underground no matter how large the mine grows nor how many machines are involved. The army engineers recently installed a 230-kv underground cable at Garrison dam, Riverdale, N. D. The new 9,600 ft cable is a pipe-type, oil-compression unit, far surpassing in capacity the next largest which is rated at 138 kv. Garrison dam itself is the largest earth-filled dam in the U. S

So the word is that if increased mechanization in the mines depends upon beefed-up transmission facilities, the cables will be available. Just state your size, sir.

Mr. Franklin's Bequest

Benjamin Franklin in his will bequeathed the city of Boston $5,000. This may appear to be a small sum to leave to a city the size of Boston, but Mr. Franklin attached some conditions to the bequest that increased its value manyfold. He stipulated that city could not spend the money for 100 yr; it would have to be invested. At the end of the hundred years the money was to be divided, one part for public works and the other part to be reinvested.

In 1891, a little more than a century after Franklin's death, the fund was divided as follows: $391,168.68 for public works, and $102,455.70 for reinvestment. All this from the original $5,000. The fund now contains over $900,000 and will grow even more in the years before it is divided again. The remarkable Mr. Franklin teaches thrift.

Farsighted companies in our own industry have seen modest investments grow by following Franklin's example of investing wisely and using the proceeds intelligently.

The choice between stripping or deep mining in problem cover is settled by deciding to build a larger shovel to obtain highest recovery, open reserves, use present facilities longer.

THE MOUNTAINEER. . .60-yd bucket, 12,000 hp.

Hanna Coal's 60-Yd Shovel

THE STRIPPING-RATIO recently took it on the chin again when Hanna Coal Co. put its Mountaineer shovel to work. This gigantic machine, swinging a 60-yd bucket in a 50-sec cycle, is removing overburden that averages 94 ft in thickness to expose the 4½-ft Pittsburgh seam at Georgetown No. 12 mine near Cadiz, Ohio. The new shovel is capable of handling up to 110 ft of cover as long as spoil room is available, and some of this duty is ahead for the Mountaineer.

The 160-ft-high machine, designed in the main by engineers of Hanna Coal Co., Marion Power Shovel Co. and General Electric Co., was erected at the mine from parts shipped to the site from the Marion and General Electric plants. Development of the shovel features several new departures from accepted practice, such as, transmission of electric power at a nominal potential of 6.9 kv, use of all-welded construction techniques, employment of an analog computer in digesting the mathematics of designing the electrical equipment and use of a new type of high-strength steel throughout the front-end assembly.

In explaining why the Marion 5760 was built, James Hyslop, Hanna Coal's president points out that extensive coal reserves still are available in the immediate vicinity of present operations. However, the overburden is in the twilight zone of thickness, where a question arises as to whether the coal should be deep-mined or recovered by stripping. Hanna's relatively smaller shovels with 50-yd buckets could not operate efficiently at this increased depth.

The decision to continue stripping with a bigger shovel is based in part on the fact that recovery in stripping is higher than in deep mining, making it possible to fully exploit the newly-opened reserves. Furthermore, the company already has a tremendous investment in overburden preparation equipment, strip-mine haulage units, a network of high-speed haulage roads and a new high-capacity cleaning plant. Therefore, higher percentage recovery through stripping insures fullest recovery of the investment in these auxiliaries.

MOUNTAINEER POWER

The 10-yd increase in the bucket capacity of the Mountaineer over that of Hanna Coal's other shovels necessitated a proportionately much larger increase in the total horsepower built into the shovel. Much of this increased power is needed in the duty of accelerating and decelerating the 90-ton

loaded bucket at the end of a 92-ft-long dipper handle as the shovel swings through a 105-deg arc from loading point to discharge point.

The weight in the shovel which is needed to back up this sort of operation further increases the total inertia of the machine. It is this inertia which may determine the limit in size of power shovels, Mr. Hyslop says.

Power is transmitted to the shovel through a 4-in. Type SHD, rubber armored trailing cable at 6.9 kv from a 5,000-kva, 66,000-6,900-v portable substation. The large amount of power involved in the operation of the new shovel makes the use of higher distribution voltage imperative.

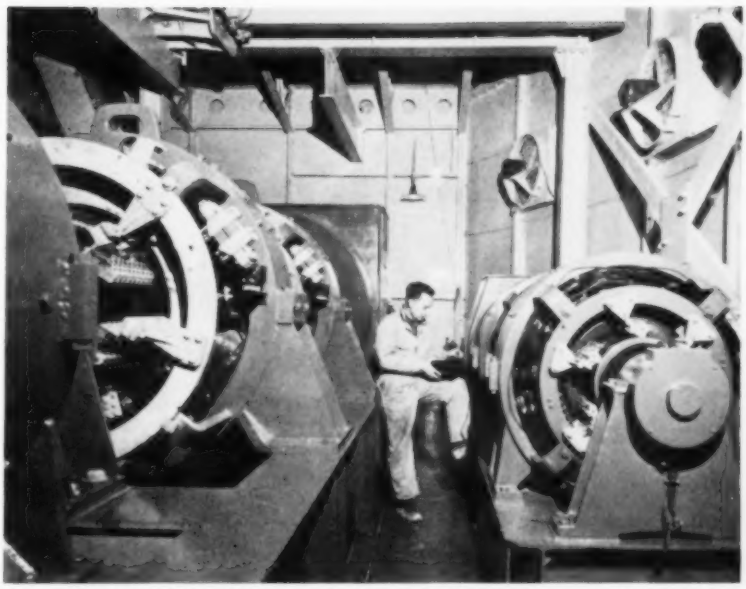
Two motor-generator sets supply DC power under Ward-Leonard control for the main motion motors. The larger set is driven by a 3,500-hp synchronous motor operating at 1,200 rpm. This motor drives four 400-kw, 250-v DC hoist generators, each having a no-load voltage of 600 v and stalling current of 3,200 amp. The large motor also drives a 330-kw, 500-v DC generator which supplies power to the two crowd motors connected in series.

The smaller m-g set includes a 1,000-hp synchronous motor driving two 330-kw, 500-v DC generators which supply power to four vertically-installed swing motors with a combined rating of 750 hp. Hoist motion is powered by four motors, each with a nominal rating of 425 hp and providing a combined maximum hoisting effort of 4,000 hp. The hoist motors are designed with a flat torque characteristic, providing a steady 500,000-lb bail pull from standstill to full speed.

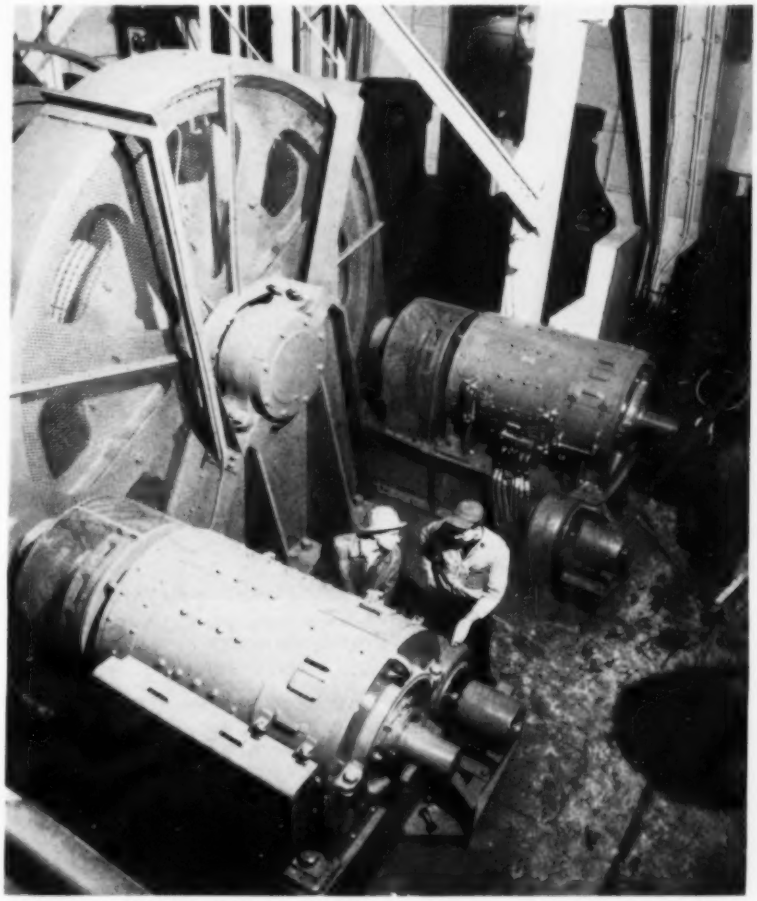
Control equipment for each of the three motions (hoist, swing and crowd) is combined Amplistat, Amplidyne and Ward Leonard, providing maximum control of acceleration, deceleration, current, torque and power peaks and plugging. Field-control equipment is provided in the 3,500-hp synchronous motor to give a high torque characteristic under heavy loads and a leading 0.8 power factor for the improvement of mine voltage under heavy loads. The new shovel also features independent traction drive by four 250-hp wound-rotor induction motors controlled from a steering station in the lower frame. The machine moves at a rate of 4 mph and will negotiate grades up to 30%.

AUTOMATIC LUBRICATION

Metered lubricants are furnished automatically to 522 points from two central dispensing stations, one in the



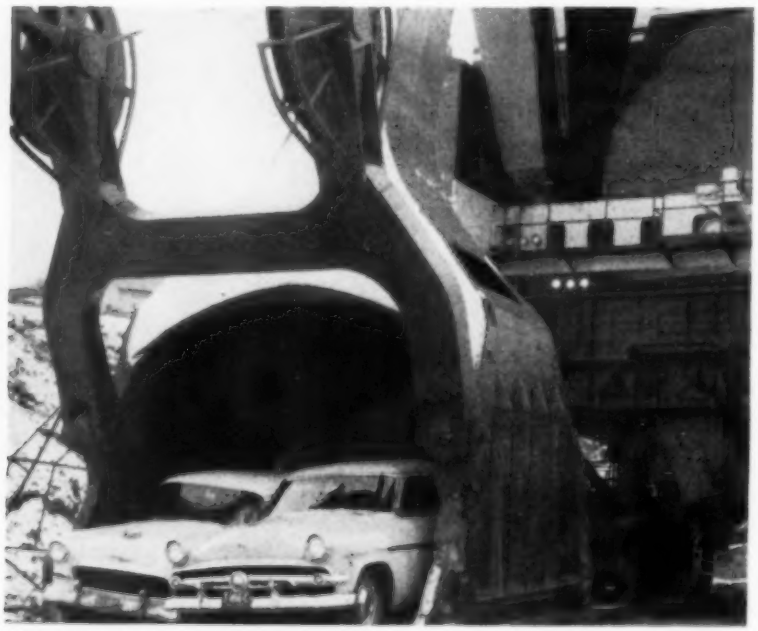
MAIN MOTOR-GENERATOR SET provides 6,840 kw to power the working motions of world's largest shovel now in operation around-the-clock.



MORE LIKE THE ENGINE ROOM OF A SHIP . . . this view of machinery deck shows two of four DC hoist motors for large bucket.

ANALOG-COMPUTER DESIGNING of Mountaineer's power system is studied by builders' engineers.

THREE-PASSENGER AUTOMATIC ELEVATOR, installed in 6-ft-dia center pin, may be used while shovel works.



ALL-WELDED, ROLLED-PLATE BUCKET will deposit spoil 290 ft from point of loading in piles up to 100 ft high

upper revolving frame and the other in the lower stationary frame. The bearing rollers in the 38-ft-dia circle rail are in relative motion with both the revolving and stationary sections of the machine, making it impossible to feed these rollers from either of the central stations. Nevertheless, each of these rollers also receives a metered supply of lubricant every 4 hr. Rollers in each quarter of the circle are connected in series to a common master fitting, and within 3 or 4 min the oiler can service the entire set of rollers using a hand-operated pump.

The system was designed by Hanna's lubrication staff, headed by Wayne S. Fuhr, lubrication engineer. Consumption of grease for around-the-clock operation is expected to be about 5 drums per mo.

CONSTRUCTION FEATURES

No rivets were used in erecting the machine; all joints are welded. This required the most up-to-date techniques of welding engineering, culminating a welding research and development program carried on by Hanna Coal officials since 1943 in shovel-building activities.

The entire front-end assembly, including bucket, dipper handle and boom, is made of a new high-strength steel alloy developed for the purpose by U. S. Steel Corp. A feature of the steel is that to a greater degree it maintains its physical properties after welding.

The bucket is made of welded rolled plate and is an integral part of an assembly which also includes the dipper handle. The joint between bucket and handle also is welded and the assembly is changed as a unit when a bucket replacement is called for. Procedures like this have helped materially in reducing the time required for a bucket change by Hanna's "Bull Gang."

Hanna Coal Co. Div., Pittsburgh Consolidation Coal Co.:

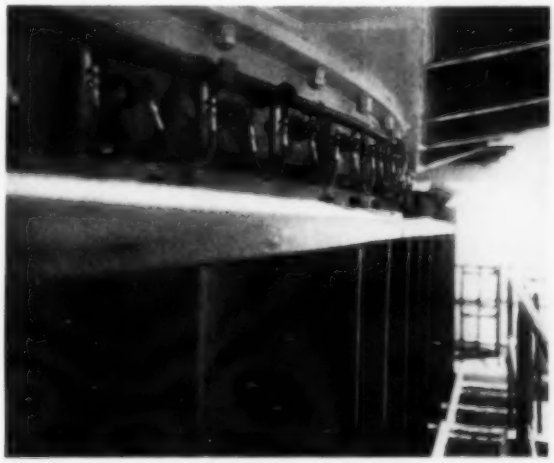
Operating and Engineering staff

President—James Hyslop
Executive vice president—J. D. Reilly
General superintendent of strip mines—J. S. Harmon
Chief engineer—Andrew Hyslop Jr.
Lubrication engineer—Wayne S. Fuhr
Safety manager—W. J. Schuster

CRAWLERS are independently driven and controlled from steering station in lower stationary frame.

SHOVEL OPERATOR works in radio- and telephone-equipped air-conditioned cab with full view of bucket.

POWER is carried to shovel at 6.9 kv through 4-in. Type SHD trailing cable carried on powered reel.



CIRCLE-RAIL ROLLERS are connected in series to lubrication points. There are over 500 lubricators.

The main machinery deck of the upper revolving frame is a machined surface, providing the near-perfect flatness required for alignment of the machinery. This is a machining job of the largest magnitude.

Hoist ropes consist of a double two-part line of 2½-in wire rope, 1,160 ft total length. The two point sheaves are pivoted in the boom point to maintain alignment of the ropes, eliminating even the slightest fleet angle as the bucket is hoisted or lowered. Boom support is provided by four 3⅝-in cables, each with a breaking strength of 800 tons. Ultimate strength of hoist ropes is from 275 to 300 tons each.

Not the least of the new features in the Mountaineer is a three-passenger elevator inside the center pin. The elevator may be used while the shovel is working, eliminating a hazard to crew members in traveling from the stationary frame to the revolving frame while working about the machine. Aside from this safety advantage the elevator also saves time in maintenance work, in handling small supplies and in changing shifts.

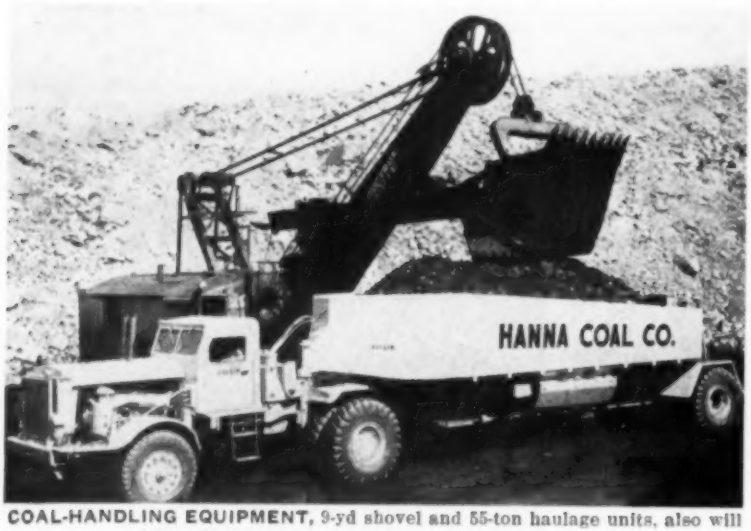
The gigantic shovel is staffed by three men per shift, an operator, an oiler and a ground man, as are the other smaller Hanna shovels. The operator works in an air-conditioned cab equipped with two-way radio for company-wide communications. He is in touch with other stations on the shovel by telephone. The only controls for shovel motions consist of two pedals, two levers and a whistle cord.

The Mountaineer is equipped with four automatic, electrically-powered, hydraulic leveling jacks, one at each corner of the lower frame. The jacks keep the revolving upper frame absolutely level while operating, even though the machine may be standing on uneven terrain.

COMPUTER DESIGNING

The total load of the installed electrical equipment is in excess of 12,000 hp on the nameplates, al-

HANNA'S "SMALLER" SHOVELS will continue to work in overburden up to 70 ft thick, leaving deeper cover to be handled by the new shovel.



COAL-HANDLING EQUIPMENT, 9-yd shovel and 55-ton haulage units, also will follow Mountaineer to recover 4½-ft seam of coal.

LONGER LIFE for Hanna Coal's modern preparation plant is assured in the new reserves made available by the bigger shovel.

though continuous operation at 20,000 hp is not out of the question. Design of a power excavator like this, having more than twice the power of any similar machine previously built, presented a real challenge to the electrical manufacturer. Preliminary study indicated that construction of a model could not be depended upon for accurate solutions of the problems. Therefore, it was decided to use the analog-computer technique which had been successfully applied to other electrical engineering problems.

Through the use of the computer, an adequate design of the power system was set up and run through simulated adjustments and tests in a minimum of time and without incurring any preliminary expense for construction and testing. Characteristics of the various machine fields and Amplistate-Amplidyne controls were worked out and checked on the computer. A large number of duty cycles for each of the shovel motions were electronically investigated to ascertain the results in power, speed, acceleration, shock loading and so on, of various control schemes and adjustments. From these studies, the best arrangement of equipment and adjustments were readily determined.

It is estimated that energy consumption will average about ⅜ kwh per cu yd of overburden moved to the spoil banks.

In pinpointing the caution with which the $2,600,000 investment in the shovel was approached, Mr. Hyslop explained that in addition to the power problems related to overcoming the inertia of the 2,750-ton machine, other factors such as bucket fillability and cycle time had to be considered. A 60-yd bucket is not worth considering if it cannot pick up 60 yd of material on every bite or if it takes too long to get its full load. Similarly, a 60-yd machine in a 70-sec cycle, say, is no competitor for a 50-yd machine in a 50-sec cycle. The gain in efficiency comes from a bigger bucket loaded to capacity on every swing operating in a cycle that compares favorably with that of present machines. The Mountaineer is designed for this purpose, further increasing the advantages to be realized from handling deeper cover.

Other Hanna operations will not be affected materially. Vertical drilling and Airmite blasting will be used in overburden preparation, and coal loading and haulage will be handled as before.

The coal will be hauled to Hanna Coal's modern Georgetown preparation plant to be cleaned, sized and treated for marketing.

Trouble-Shooting in Hydraulic Systems

By M. E. ALTIMUS, JR.
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Pennsylvania State University, University Park, Pa.

The Author:

Mr. Altimus has organized vocational classes in certain mining centers of Pennsylvania for the purpose of training mine-maintenance personnel in the fundamentals of hydraulics applications and maintenance. His responsibilities in this work included assembly and development of instructional materials and aids and authorship of an extension text on hydraulics in mining equipment.

—Editor

THE ERA OF HYDRAULIC-POWERED MINING EQUIPMENT has definitely increased the required abilities of the mine mechanic. Accurate trouble-shooting can be accomplished only after acquiring a basic knowledge of the fundamentals of hydraulics and functions of hydraulic components. Knowledge is the best trouble-shooting tool, regardless of the kind of energy-driven mechanisms to be maintained.

As in other power fields certain types of trouble are more prevalent than others. This would indicate a possible means of approaching the trouble-shooting problem. Since each type of hydraulic system presents its own troublesome problems, a foundation of acquired hydraulic knowledge to supplement the experience obtained from an individual system is quite necessary. Trouble-shooting differs from other duties of a mechanic in that it involves the ability to interpret the cause of the failure.

There is no doubt that leakage is the biggest problem, but from where does it stem? How can it be detected? Technically what can be done about it?

DETECTING LEAKAGE

Leakage may occur between internal sections of a component or externally wherever a thread or flange makes it convenient. It can cause sluggish operation of the individual unit, unbalance the entire system, or lead to freezing or sticking of the component. Detecting the type of leak and the unit causing the trouble is a small portion of the trouble-shooting job as compared to the job of reasoning and interpreting the initial source. Was it a defective unit, wrong type of seal, improper hydraulic fluid, entrance of foreign material into the system, ineffective filtration, or fatigue from normal operation? Every hydraulic problem has many possible answers.

Leakage can also result from entrance of air into a system. If this is included, a number of additional questions may need answers before one can interpret the source of trouble. Were the seals installed correctly? What is the cause of excessive vacuum? Is the type of thread on the fittings correct for the job?

A survey of the testing devices employed in trouble-shooting fortifies the stand that knowledge is the most important tool. The section mine mechanic must depend upon information presented by the pressure gage. Occasionally a temperature indicator, tachometer, a 5-gal. container, and a stop watch are available. The question is, how useful are they if they are used improperly or if their readings are misinterpreted.

BASIC KNOWLEDGE IS NEEDED

Basically, a thorough understanding of the operation, functions and construction of the essential hydraulic units as well as the factors affecting their efficiency of operation is necessary to provide adequate production maintenance. A hydraulic system essentially consists of a reservoir for the fluid supply, conducting lines, hydraulic power generator, control mechanisms and a recipient motor to do the desired work. The following points out some of the features of hydraulic components that are often overlooked as the source of trouble and suggests how to approach the interpretation function of trouble-shooting.

IMPORTANCE OF THE FLUID RESERVOIR

Too much emphasis cannot be placed on the importance of the functions of the fluid reservoir. It holds the fluid supply, supplies the requirements of differential cylinder circuits, permits accumulator charging, provides a settling chamber for the removal of solid matter and dissolved gases, and acts as a radiating surface permitting the escape of heat from the fluid. The tank is also a convenient point to fill the system or check on the condition of the oil, and offers a surface upon which various hydraulic components may be mounted.

Many features must be included in its design. Tank capacity is very important, and perhaps because of space limitations is one of the basic construction features often restricted below the required volume. An accepted rule states that the volume of the reservoir should be equal to at least three times the rated delivery of the pump or pumps in gallons per minute. Insufficient oil supply is often the cause of high operating temperatures (above 130 F) and noisy pump action (air in suction line or cavitation). The tilt of the machine can lower the oil level below the end of the suction standpipe.

One source of excessive leakage, air or fluid, may be traced to the lack of oil. It is possible at times to reduce

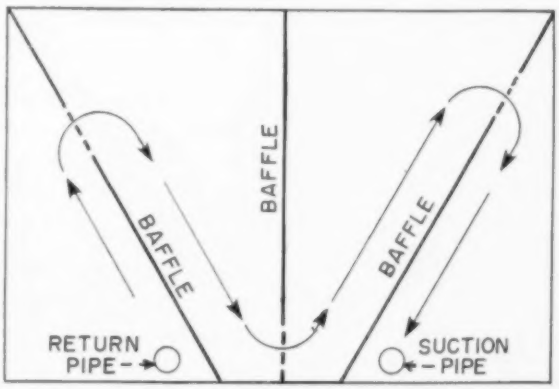


FIG. 1—Top view of a baffled tank.

this trouble by filling the tank whenever the large cylinders are extended, particularly if continuous rotary motor circuits are employed in the system. Or a small additional tank can be installed to gravity-feed the main tank. The return and component drain lines then should be transferred to the small tank. In several instances exterior fins have been welded onto the tank to provide extra cooling surfaces. In any case steps should be taken to guarantee ample circulation of air around the tank and the tank surfaces should be kept as clean as possible.

Baffles such as those shown in Fig. 1 are installed within the reservoir to prevent excessive vortexing and surging of the fluid. Preventing this action not only removes the possibility of air entering the fluid but also provides the opportunity for dissolved air to escape. Baffles also prevent the oil from passing directly from the return line to the suction port. The oil is given ample time to mix in the tank and thus lose its accumulated heat. The double tank arrangement can be employed to get the advantages of baffles if the original reservoirs are without them.

The tank should be sealed to all foreign matter from any source. An air filter should be provided for the breather. Filler opening should contain a finger-type strainer of approximately 200 mesh. Needless to say they must be cleaned regularly. Put them on your daily inspection list.

FUNCTIONS OF HYDRAULIC FLUIDS

A high-quality fluid is one of the most important factors influencing the performance of a system. Freedom from frequent servicing, reduced maintenance costs, and maximum production from long hydraulic-component life are beneficial results of matching the oil to the working system and its conditions. The solution to a leakage problem may stem from the use of an improper fluid for it must be understood that the hydraulic fluid not only transmits power but provides lubrication as well. In the choice of an oil both of these functions must be considered. An oil which has the ability to transmit hydraulic power may not possess good lubricating characteristics or vice versa. There are many chemical and physical specifications offered to assist in selection. Usually, viscosity, viscosity index and pour point are relied upon to make the proper selection. While they are relatively important it is often wise to inquire into chemical stability, affinity for air and water, compatibility with metals and packing materials in use, and irritation and toxic effects.

No other single factor affects the performance of a hydraulically-powered machine more than viscosity. Pump slippage, cavitation, fluid friction, mechanical friction, oil leakage and rate of activation are dependent on the fluid viscosity. The lubricating ability of an oil is determined by its viscosity. Numerous problems can stem from the use of an oil of improper viscosity.

If viscosity of the oil is too high, the following undesirable results will occur:

1. Pressure drop through the line and clearances between close fitting parts become excessive.
2. Temperature increases.
3. Rate of actuation decreases.
4. Power consumption rises.

If the viscosity is too low, the following effects may be noted:

1. Internal and external leakage increases.
2. Pump efficiency is lowered by the rise in slippage and temperature.
3. Rate of wear of moving parts increases.
4. System loses pressure.
5. Controls lose effectiveness.

Since dirt and other contaminating materials will alter the viscosity of an oil if allowed to accumulate, periodic oil changes and cleaning of hydraulic systems are recommended. Mining equipment hydraulic systems require an oil which is pumpable at the mine ambient temperature of approximately 65 F and viscous enough to carry the transmission of hydraulic energy efficiently at recommended operating temperature of 130 F. There are instances when a lower viscosity oil is needed. For instance, should a machine be employed near the bottom of a shaft where temperature changes occur with the seasons, the use of various viscosity oils with the changes of season merits investigation.

INVESTIGATE CHEMICAL STABILITY OF FLUID

The chemical stability of an oil is affected by temperature, presence of air and water, catalytic effect and reaction rate of metals, and is intrinsic to the crude employed. The chemical reaction between the oil and oxygen is most detrimental. Resins, varnishes, lacquers, sludge, and acids are formed by oxidation of oils.

Soluble resins discolor the oil and increase its viscosity. The varnishes, lacquers, and sludge are formed from the soluble resins when they come in contact with hot metallic surfaces or particles. The varnishes and lacquers bake onto the enclosing surfaces causing malfunctioning pumps, valves and motors. Sludge generally settles out at some low point or collects in or clogs small orifices and tightly fitted parts. The acidic products react with the metal surfaces to destroy the precision-machined parts.

Whenever units are removed because of their ineffectiveness, spot checks should be made to determine the amount of varnish and lacquer deposited and the extent of the pitting caused by acid and metal reaction. Many in the mining industry ship oil samples periodically to their suppliers for chemical analysis.

Should the rate of oxidation prove excessive, the following maintenance procedures may be employed to reduce them:

1. Reduce possibility of oil splashing whenever it flows back into the reservoir by keeping the return line opening immersed in oil. It may be necessary to add a piece of pipe to the return connection within the tank.
2. Keep suction lines airtight. Air compressed by pressures found in most hydraulic systems of mining equipment may rise to temperatures over 1,000 F.
3. Maintain proper oil level (too high is as bad as too low). Never overfill as air cannot escape and the oil will foam and enter the system or flow out the breather opening.
4. Care should be exercised in adding make-up oil. Add only the oil employed in the system. Strain or filter the added oil, and do not allow excessive splashing.
5. Reduce leakage around low-pressure points. Systems designed with a return line on the suction side of the pump may allow the entrance of air anywhere along its entire length.
6. Restrict possibly causes of high temperature. Check system for local hot spots, insufficient reservoir capacity, excessive operation of relief valve, and induced turbulence or agitation of the oil.
7. Adjust valves and pumps properly.

Should these methods fail, selection of a different fluid may be necessary.

USING PROPER PACKING MATERIALS

The compatibility between the hydraulic fluid and packing compounds should be investigated. One bit of information concerning petroleum-base liquids that will help determine compatibility is its aniline point. While the aniline point in itself is of little signficance (lowest temperature at which equal volumes of freshly distilled aniline and oil are completely miscible), the characteristic swell or shrink

effect of the oil upon packing or synthetic-rubber compounds is determined by it. In general, a low aniline point oil (157 F) produces the maximum swelling effect upon rubber compounds. A high aniline point oil (255 F) causes the minimum amount of swelling. In summary, a compound that is satisfactory for use with low aniline point oils may shrink in high aniline point oils, while a packing compound recommended for use with high aniline point oils may swell excessively in low aniline point oils. The majority of hydraulic-component manufacturers recommend an aniline point of 200 F and use suitable packing.

The ASTM and SAE classify compounds by the amount of swell in low aniline point oils. Type SA compounds undergo a low volume swell (0 to 10%) in low aniline point oils, while SC compounds may swell from 10 to 140% in the same oil. Type R, which includes natural and some synthetic-rubber materials, should never be used with petroleum-base oils.

The compatibility of fire-resistant-type hydraulic fluids with seals, gaskets, hose, metals and lubricants should be investigated before employing them in a particular system. The halogenated hydrocarbons are very rough on synthetic-rubber packing. However, low-swell Buna N compound and Teflon or Kel F, if designed correctly, will function satisfactorily. Synthetic phosphate-ester fluids generally require butyl rubber or silicone seals, packing and hoses. The water-base or water-glycol type fluids present different sealing problems as associated with the individual brand. After considering the various functions of the seals and the temperature range involved, either Buna N, neoprene, silicone, or butyl materials may prove suitable. Butyl rubber base and silicone base compounds are recommended for tricrisyl-phosphate type fluids. Seals required for the carbonated diphenyls are of the Buna N, butyl rubber, or silicone base compounds. Finally, the emulsified and homogenized water-oil base fluids can be retained satisfactorily by Buna N, neoprene, and silicone-base sealing compounds.

Compatibility of fire-resistant fluids and metals should be investigated whenever a change to this type of hydraulic fluid is contemplated. Various plating materials, such as galvanize and cadmium, will react chemically with most of these fluids. It is recommended and suggested that magnesium, cadmium, zinc, galvanize, ternplate or tin-plated fittings, conducting lines, couplings and other component parts not be used with fire-resistant fluids. The hydraulic component and fluid manufacturers can supply needed information on this matter.

The reaction between lubricants and hydraulic fluid should be investigated particularly whenever the association can occur. In some instances it may be found that a gummy and sticky mixture is obtained which can cause the loss of the unit or its bearings.

Basic trouble-shooting information concerning hydraulic fluids is listed in an accompanying chart. Each illustration is initially caused or noted as excessive leakage.

TRACING TROUBLE IN FLUID LINES AND FITTINGS

In general, selection of fluid lines and fittings and their location on mining machines are made by the equipment manufacturer. If they have made the proper selection and located them for accessibility, there would be little reason for the mining machine maintenance personnel to acquire additional information concerning fluid lines and fittings. However, one seldom finds a used machine with the originally designed system. Excessive leakage and reduced hydraulic component life can and does stem from relocation and improper selection of replacement fluid lines.

Since there is a considerable amount of information used in determining the selection of the fluid conductors, the following portion of the article will deal only with the more common factors.

Hydraulic-Fluid Trouble-Shooting

Symptoms	Trouble in Hydraulic System	Cause
Sluggish action in normal operation	Slow action of valves and cylinders. Movement limited by accumulation of resins, lacquers, and varnishes.	Oil oxidation
	Oil too thick	Oil oxidation, evaporation, or contamination
	Viscosity change during service.	
	Improper choice of oil.	Wrong viscosity for working conditions and equipment
Sluggish starting action	Oil too thick—low temperature	Pour point too high
Varying action hourlyordaily	Variable fluid flow changing operating temperature	Low viscosity index
Erratic action	Valves do not seat properly, deposit accumulation.	Oil oxidation
	Excessive valve and piston wear. Leakage increases, pressure drops.	Low lubricity
	Fluid compression—foaming oil.	High surface tension
Dirty oil, rapid clogging of filters, etc.	Deterioration of packing, seals, and hose.	Incompatibility
Pump noisy	Probably pump cavitation.	Viscosity too high

Probably one of the most important items to remember in changing to a different type of hydraulic line, that is, from flexible to rigid, is the variation in designation of line diameters. Pipe sizes are given as the nominal inside diameter in inches. The outside diameter of pipe remains the same regardless of the pipe schedule or wall thickness. Tubing is purchased according to its outside diameter in inches. The wall thickness is determined by the working pressure and tubing material. Flexible hose sizes are specified as the inside diameters with variations in the outside diameters. The system pressure governs the hose construction and thus its wall thickness.

This manner of determining the size of a line presents several problems which may be the cause of excessive external leakage or intake of air. Table I illustrates this matter. To complicate matters still further the four main hydraulic hose manufacturers vary their construction in one manner or another so that there are as many outside diameter dimensions. This practice almost compels the purchaser of each of these hoses to secure the fittings made for them. In other words, mated fittings and hoses should be employed.

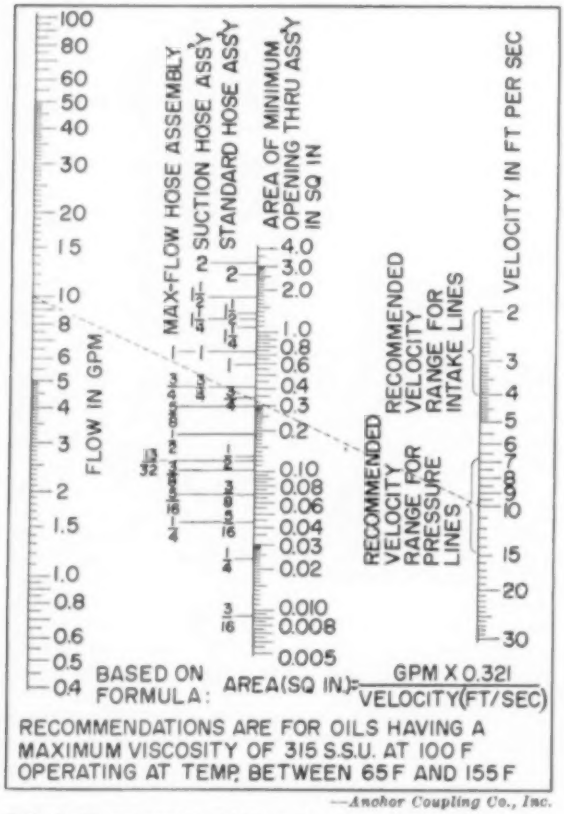
The significant fact concerning the inside diameters of the various types of hydraulic lines lies in the change in velocity of the fluid whenever there is change from a ½-in hose to ½-in steel pipe. In some instances the velocity may be increased to the point of creating turbulent fluid flow, cavitation of the pump, and so on. When changing from flexible to rigid lines always match inside diameters

TABLE I—Comparison of Hydraulic Fluid Line Sizes

Type Material	Inside Diameter, In.	Outside Diameter, In.	Wall Thickness, In.
½-in. Steel Pipe			
Schedule 40	0.391	0.84	0.109
Schedule 80	0.353	0.84	0.147
Schedule 160	0.313	0.84	0.187
½-in Tubing			
Steel	0.425	0.50	0.075
Aluminum	0.417	0.50	0.083
½-in Hose			
Single-wire braid	0.50	0.922	0.211
Double-wire braid	0.50	0.968	0.219

and not reference sizes. Also keep in mind that increasing the diameters of any type of line decreases the strength of the line.

While there are factors which restrict the maximum velocity of fluid flow, reference to possible satisfactory velocities in various lines of a system may serve as a guide to assure laminar flow whenever inside diameters are changed. Suction and drain lines are designed ordinarily for velocities of 2 to 5 fps. Velocities in return lines are generally held below 10 fps and pressure lines below 15 fps. Lines to low-pressure auxiliaries and controls are of ample size to insure that pressure drop does not cause sluggish actuation. Flow velocities through flexible hose of various sizes can be determined from Fig. 2, which is reproduced through the courtesy of Anchor Coupling Co., Inc.


FLOW IN GPM
MAX-FLOW HOSE ASSEMBLY
SUCTION HOSE ASSY
STANDARD HOSE ASSY
AREA OF MINIMUM OPENING THRU ASSY IN SQ IN
RECOMMENDED VELOCITY RANGE FOR PRESSURE LINES
RECOMMENDED VELOCITY RANGE FOR INTAKE LINES
VELOCITY IN FT PER SEC
BASED ON FORMULA: AREA(SQ IN)= GPM X 0.321 / VELOCITY(FT/SEC)
RECOMMENDATIONS ARE FOR OILS HAVING A MAXIMUM VISCOSITY OF 315 S.S.U. AT 100 F OPERATING AT TEMP. BETWEEN 65 F AND 155 F

—*Anchor Coupling Co., Inc.*

FIG. 2—Flow capacity of hose assemblies at recommended flow velocities.

CUTTING AND FLARING TUBING

With the exception of stainless steel tubing a tube cutter is recommended for cutting a tube to length. Besides the advantage of leaving a square edge, cutter marks or scratches are made concentrically on the surface. Marks made in this manner do not lead to the possibility of splitting during the flaring operation as do the radial marks produced by a hacksaw blade. Stainless steel tubing should be cut with a hacksaw or mechanical cutting disc because a tube cutter tends to work-harden the ends making it difficult to flare.

Improper installation of flare and flareless fittings is probably the most common cause of leakage whenever tubing is used. There are two important factors to remember before making a flare, namely (1) the location of the tubing and (2) the gripping of the tube by the die to prevent slipping and undersized flares. It is disregard of these factors that produce short and long flares. Tubes flared too short do not present a full clamping area to the fitting and the flare is squeezed thin. Tubes flared too long may stick and jam on threads of the fitting nut when assembled. The correct length and diameter of flare result when the outside corner of the flare extends beyond the maximum inside diameter of the sleeve's toe but not beyond the outside of the sleeve, as illustrated in Fig. 3.

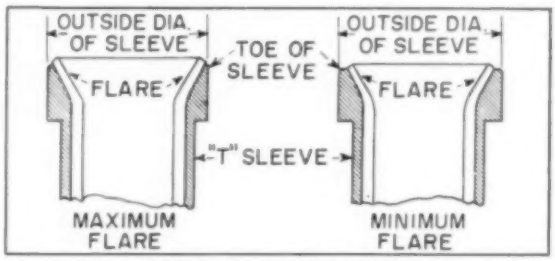


FIG. 3—Proper tube flaring.

Common experience associated with tube bending notes that the sharpness of the bend, tube material, and bending practices affect the flow and performance of the hydraulic system. Bends sharper than three times the outside diameter of the tube offer greater resistance to flow. They are very difficult to form without wrinkling or flattening. When tubing or hose is buckled or flattened, it will fatigue and fail at these points faster than one with a perfect bend.

A flattened bend is caused by having the mandrel not far enough forward in the tube, by bending thin-walled tubes without a mandrel, or by trying to bend too sharply. A kinked bend is caused by allowing the tube to slip in the bender. The wrinkled or buckled bend is produced whenever thin-walled tubing is bent without a mandrel.

The one major mistake made when installing flareless fittings is applying that extra term for good measure. Each fitting manufacturer recommends an installation procedure. It should be followed to the letter.

If leakage occurs after installing a flareless fitting, it should be disassembled and inspected and not subjected to the increased-torque procedure. The inspection should include (1) checking the distance between ring biting or gripping edge and end of tube with the recommended value, (2) assuring the end of tube is contacting the seat of the connector, (3) noting the amount the tubing has collapsed and (4) noticing whether the ring or sleeve moves forward or backward on the tube. Depending on the type employed, it may be permitted to rotate.

PROPER USE OF HYDRAULIC HOSES

Hydraulic-hose assemblies are used extensively as fluid carriers on mining equipment. The flexibility of hose eliminates many of the problems arising from relative movement between machine components, vibration, impulse loads and installations characteristic of mining machines. However, it does have some disadvantages which may or may not be characteristic of other type lines. Inasmuch as there are occasions when a switch from the hose assemblies installed by the machine manufacturer is in order, it should not be done without considering such factors as compatibility with fluid, resistance to abrasion, impact, oil and grease, and the working pressures and temperatures. For example, the possibility of a low-pressure line being cut, scraped, or rubbed by other moving equipment or by moving parts because of its location may indicate the need for a hose carcass found on high-pressure hose. Or perhaps seamless steel tubing is the answer to a hose problem stemming from excessive exterior temperatures created by nearness to electrical resistors or motors. In fact many maintenance supervisors have installed high-pressure hose on all lines to eliminate the possibility of damage caused by inserting a low-pressure hose in the high-pressure side of the system.

Hydraulic component trouble may also be traced to failure to consider carrying capacity, mismatched hose and hose fittings, and using hoses of improper length. If hose diameters are too small, the unit will not get the volume of oil required. If the diameters are too large, the pressure may be reduced below an effective value.

Excessive external leakage or hoses blown from their fittings is often caused by not matching the coupling diameter to the hose outside diameter. A quick check on these dimensions of each manufacturer will show considerable variations. Apply the correct coupling properly.

Length of hose assemblies must be long enough to avoid excessive stretching during installation or when internal pressure is applied. It should also be short enough to eliminate kinking. A kinked or wrinkled hose will restrict the flow and fatigue rapidly.

The selection gage in Fig. 4 is based on the recommended hose construction for maximum working pressures. In general a safety factor of two is designed into the hose construction. Therefore, the expected burst pressure for a 3/16-in double wire braid hose is approximately 9,000 psi. The outside gage scale indicates the hose inside diameters recommended for use up to the working pressures to the right of the line. Only standard hose sizes are given. The values shown in the inside concentric ring are the recommended maximum carrying capacities (gpm) for streamline flow for each size of hose.

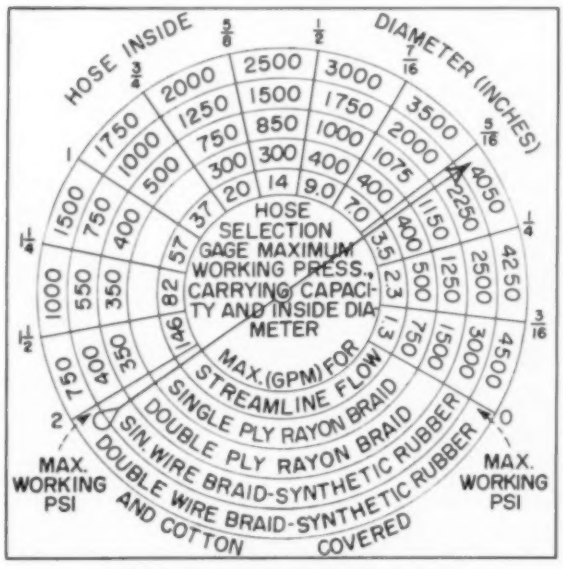

HOSE INSIDE DIAMETER (INCHES)
HOSE SELECTION GAGE MAXIMUM WORKING PRESS., CARRYING CAPACITY AND INSIDE DIAMETER
MAX. (GPM) FOR STREAMLINE FLOW
SINGLE PLY RAYON BRAID
DOUBLE PLY RAYON BRAID
SIN. WIRE BRAID-SYNTHETIC RUBBER
DOUBLE WIRE BRAID-SYNTHETIC RUBBER AND COTTON COVERED
MAX. WORKING PSI
MAX. WORKING PSI

FIG. 4—Hydraulic-hose selection gage.

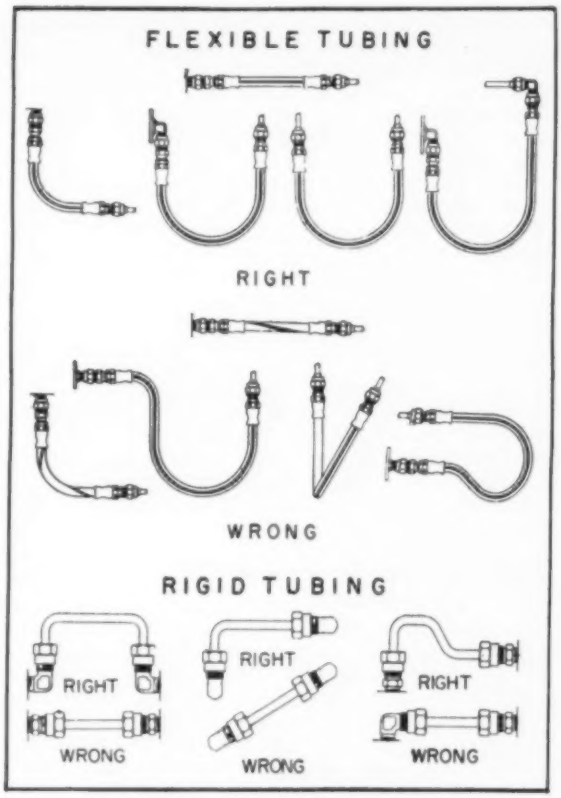


FIG. 5—Do's and Don'ts in hose installation.

The installation of fluid lines must be done with some thought toward the effect of the radius of bend or a large number of bends, loose joints, metal fittings, pressure surges, amount of flexing, length of assembly, twists and so on. A few common wrong and right ways of installing lines are shown in Fig. 5. Besides these factors, line life or periodic replacement should be considered when considerable damage to equipment or harm to personnel is possible in the event of line failure.

REPLACING PACKING TO SOLVE LEAKAGE PROBLEMS

Excessive downtime often is attributed to defective packing when actually other factors are at fault. Each time a packing unit or set fails, the surface finish clearances, eccentric loading, system pressure and temperature should be checked. Surface finishes are destroyed by abrasive action of dirty oil, acid content of the oil, solids collecting on the wiper rings, or metal to metal contact. Clearances are increased above allowable tolerances by many of these same conditions. In many instances it will be necessary to replace the gland or follower to reduce the frequency of packing failure. Eccentric loading affects packing life due to unequal wear on the rubbing surfaces. The additional clearance and lack of proper support at these points cause the pinching and extruding action of the packing.

Higher hydraulic pressures than the maximum recommended for any given system affect packing life. Packing friction is increased by the additional sealing force so produced. Proper adjustment of system pressure is the remedy for the shortened packing life. Then there are occasions wher a harder type packing compound is the answer. Temperatures above normal will reduce packing life. Oxidation and swelling of the packing materials are increased by higher temperatures.

Two errors made in installing packing which probably contribute more to their failure than any others are overtightening and undertightening. Overtightening a packing prevents its automatic action and produces a high frictional drag which shortens the packing life. A loose packing set will develop a pumping action which increases or decreases with the speed of reversal and length of stroke. The leakage resulting from the pumping action can be extensive. Therefore, this possible source of trouble should be checked whenever a unit is disassembled. There are many other sources of packing failure. If packing failure is common every possible source of the trouble should be investigated. Never be satisfied with just a packing replacement.

TROUBLE-SHOOTING A SYSTEM AND ITS COMPONENTS

Once again it must be stressed that success in trouble-shooting a hydraulic system depends to a great extent upon having a full knowledge of the system and its working conditions. The performance of each unit is generally characteristic of its design, tasks to be accomplished and relationship of components with one another. The job of analyzing a malfunctioning circuit must start with knowledge of all possible reasons for the trouble and then mentally eliminating them until only the most logical ones remain. It is from this point that actual testing procedure should begin. Remember, trouble-shooting is locating the actual cause of the trouble. It does not stop once the defective unit is located.

To illustrate, let us assume that the pumping parts of an axial piston pump are destroyed in a very short time after installation. While there are many possible reasons, only a few will be suggested here. The pump design or the materials from which the parts were made could be the origin. Perhaps cavitation is the reason and this can stem from clogged filters, loose intake hose couplings, excessive driving speeds, oil of improper viscosity, high temperatures, clogged air breather and others. Then, too, it could be caused by excessive backpressure originating from any restriction as offered by a stuck pressure-control valve or a pinched hose or tube. Or the trouble may be traced to the assembly and installation of the unit.

As long as all the factors are considered, the chances of losing another pump are lessened. Visual inspection will naturally help eliminate items such as filters, pinched line, loose couplings and clogged air breather. A tachometer or an electrical check may be necessary to determine excessive speeds. Hydraulic checks may include a quick analysis of the oil to secure viscosity and oxidation information. Oxidation products may indicate excessive temperatures.

In all probability a new pump will be installed. It is at this point that alignment, torque required to overcome starting friction, procedure employed to prime pump, and so on should be investigated. Before the pump is started, pressure, flow, and temperature gages should be installed. In fact if a test stand is available the new pump could be checked out. However, this does not eliminate the need for testing the actual system. The mining-machine hydraulic system should be checked throughout its entire length while the motor or motors are subjected to loads

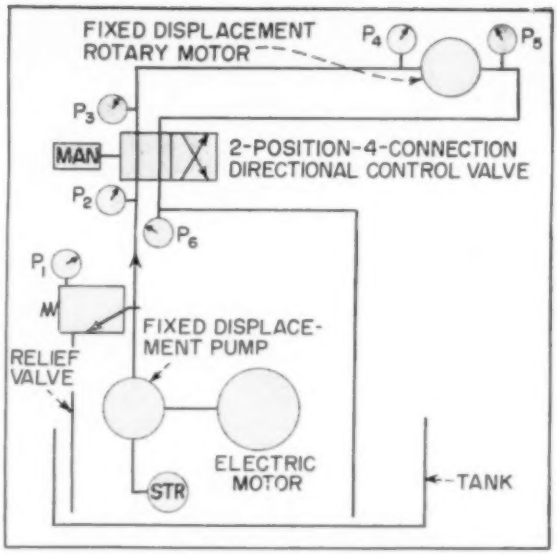


FIG. 6—Hydraulic-circuit testing locations.

varying from light to maximum working conditions or until interpretation of the gage reading indicates trouble somewhere in the circuit.

Fig. 6 illustrates possible locations to secure pressure and volume readings. Wherever a pressure gage is attached, with the exception of the one located on the relief valve, the volume check is in order. The pressures and delivery from the pump should be compared to the expected results. Pressure-gage readings along the circuit are comparable to voltmeter readings in an electrical system, with the exception that a pressure gage indicates the pressure difference between it and atmospheric pressure along the least resistant path. A pressure gage must be installed at two points in any given line in order to determine the pressure drop between these two points. For example, the difference in readings between P_2 and P_3 in Fig. 6 will give the pressure drop through the pressure ports of the directional control valve.

Flowmeter readings anywhere in the motor circuit should be the same. In other words it functions as an ammeter in an electrical series circuit. Leakage losses should be expected in the control valve and fixed displacement motor. The amount of leakage will vary with the design of the valve and motor. A representative drop in volume between points P_2 and P_6 may be 3 to 8% of pump delivery. Should the relief valve P_1 be forced open or stick in the open position, the flowmeter and pressure readings at P_2 would so indicate.

Temperature readings should be taken at the reservoir continually and spot checks made at the pressure port of the pump. A gradual rise in temperature of the oil supply and excessive temperatures at the pump will indicate pump trouble. However, if the pump temperature is normal but the oil supply keeps increasing, excessive leakage or by-passing of oil is indicated, providing pressure and return line ports of the control valve are not restricted. Pressure readings at P_2 and P_3 with those at P_5 and P_6 will provide this information.

One drawback in using testing equipment is the necessity of installing the gages. However, when the cost of the hydraulic component and the possible production loss are tabulated there are instances when the process would be a must.

Hydraulic testing instruments are almost unknown items

—Schroeder Bros.

FIG. 7—Hydraulic-circuit tester.

to maintenance personnel in the coal industry. This may also be true for other industries in which human lives do not depend upon the trouble-shooting efficiency. Pressure gages are common, particularly those mounted by the equipment manufacturers. Temperature gages are available but flowmeters generally are 5-gal cans and a watch.

A portable hydraulic circuit tester, Fig. 7, has been developed by Schroeder Brothers Corp., Pittsburgh, Pa. It consists of an ortifice-type flowmeter, Bourdon-type pressure gage, a vapor-pressure-type thermometer and a load valve.

The pressure port of the tester is connected to the delivery side of the pump and its return port is connected directly to the tank or a low-pressure return line. Manipulating the load-valve handle controls the load exerted on the pump. The fluid enters the flowmeter, which can be positioned to measure the quantity of flow in three separate ranges, 1 to 12.5, 6 to 25, and 16 to 50 gpm at pressures between 300 and 2,000 psig. The temperature gage will indicate temperatures between 60 and 220 F. The unit also contains a relief valve, check valve and snubbers to provide the necessary protection.

Testing instructions given with the tester indicate that the complete unit is subjected to the many hydraulic variables and characteristics of any complete hydraulic system. While it is an accurate instrument, comparison readings will prove more useful than a single reading. Experience with this device and the equipment will definitely enhance its value as a trouble-shooting aid. The circuit tester could well be likened in this respect to a megger in making insulation tests.

It is impossible to even hint at all the sources of hydraulic trouble. Knowledge and experience alone can provide the answers. The many valve, pump, motor and other hydraulic-component designs present their individual characteristics.

Complete understanding of each component will increase the trouble-shooting ability of a mechanic. For example, a gear pump has three leakage paths that may effect its operation: (1) end-face clearance, (2) tooth contact and (3) radial clearance. Knowledge of these eliminates much guessing on where to look for excessive leakage and the factors which cause it. Or, requiring a gear pump to operate at a higher pressure than recommended may reduce effective displacement.

TELESCOPING SUPPORTS hold line curtains in proper position in 100% roof-bolted continuous-mining sections.

Lightweight Supports Used for Line Curtains in Bolted Workings

THE DIFFERENCE IN PRESSURE on a line curtain, resulting from the difference in the velocities of the intake and exhaust currents of air, can be appreciable in a continuous-mining working place where a large volume of air over the continuous machine is necessary. In fact, the difference in pressure can be great enough to plaster the curtain against the rib, stopping the flow of air, if proper restraint on the curtain is not provided. Where conventional posts are available, the problem can be solved by attaching the curtain to the posts, top and bottom. But where 100% roof bolting is the rule, such fastening at the bottom and top-to-bottom support is not possible.

Faced with this problem, Michael Kandziolka, assistant foreman in charge of a continuous-mining section at Harwick mine, Duquesne Light Co., Harwick, Pa., devised the steel brattice supports shown in the accompanying illustration. Each support is made of 5½ ft of ¾-in pipe with a ⅝-in steel rod inside the pipe in a telescoping arrangement. A set screw turned by an extension handle operates through a hole in the pipe to bear against the telescoping rod, holding it in any desired position. A split steel washer and a piece of ¼-in steel rod are welded onto the pipe near the midpoint to provide hangers for machine cables, and a similar rod near the bottom of the pipe permits the brattice cloth to be fastened securely there. In the mine, these lightweight units are opened up to stand from the floor to the roof, supporting the line curtain away from the rib. Each continuous-mining unit at Harwick is to be equipped with a supply of the new supports.

DIESEL-POWERED DRAGLINE is the workhorse in stripping operations at Tasa where up to 90 ft of overburden is removed to expose the Pittsburgh seam. The walking dragline, swinging a 13½-yd bucket moves 250,000 cu yd per month.

Co-ordinating Stripping and

Two draglines and two highwall augers are teamed to produce 45,000 tons of coal per month at West Virginia mine.

COORDINATION AND PLANNING are keys to effective stripping and augering at the Tasa Coal Co., near W. Milford, W. Va. Operations are geared to provide a steady flow of 30,000 tons of strip coal and 15,000 tons of auger coal per month. Management's task is to plan operations so that stripping keeps well ahead of augering and highwalls and pits are left in a condition that requires little cleanup work before final augering. Balance between stripping and augering is achieved with two draglines working around the clock in separate pits and two highwall augers working only on the day shift.

SECOND STRIPPER is crawler-mounted dragline with 6-yd bucket. This machine also works to 90-ft banks (125,000 cu yd per month) in pit 75 ft wide.

Responsibility for keeping the job running smoothly rests on M. H. Busby, superintendent. Aiding him in discharging his duties are Nels Hunnicutt, coal loading foreman; John Fennel, strip foreman; James White, tipple foreman; and Clyde Newton, office manager.

Mining is in the Pittsburgh seam, which ranges from 5 to 7 ft in thickness. There are no unusual faults, dips or partings in the seam to hamper mining. The seam outcrops near the hilltops about 200 ft above the valleys and lies in irregularly shaped bodies that can be almost completely recovered by a combination of stripping and augering methods.

BREAKING THE OVERBURDEN

Material covering the coal includes 10 ft of shale, 8 ft of limestone, 6 ft of weathered shale, Redstone coal, sometimes 4 to 8 ft of sandstone, and shale to the surface. All stripping is now being done in areas that were

HIGHWALL AUGERING with two 48-in units produces 15,000 tons of coal per month, 30% of Tasa production. Machines work only on day shift in two separate pits. Average daily output is 500 tons per auger with 4-man crews.

Augering

stripped about 10 yr ago or where Tasa already had taken the first cut. The present overburden ratio is 11 to 1.

Both horizontal and vertical drilling is practiced in both of the pits to get good fragmentation and leave the highwall sheared smoothly for future augering. The nature and thickness of the overburden varies considerably over the property and therefore special attention is given to drilling and blasting.

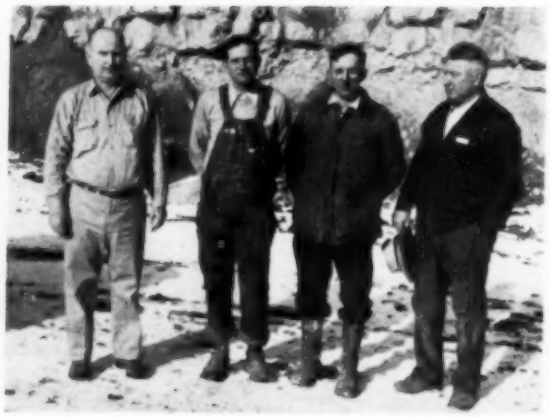
Horizontal holes are located 3 ft above the top of the coal on 18-ft centers and are drilled 66 ft deep. A McCarthy self-propelled unit equipped with a Parmanco 8-in auger head and Firthite bits handles the horizontal drilling job in each pit. A truck-mounted Winter-Weiss Portadrill equipped with a Varel bit is used for all of the vertical drilling. Each new bit bores an average of 1,800 ft of 6-in vertical hole before it is replaced and sent to the J. & D. Bit Co., Frostburg, Md., for retipping. A rebuilt bit will cut another 900 ft of hole before it is worn out.

To prepare the way for vertical drilling, a Caterpillar D8 bulldozer cuts a drill road in the hillside 70 ft back from the highwall and along a line established as the stripping limit by the engineers. The vertical drill

TRUCK-MOUNTED VERTICAL DRILL sinks blastholes along back edge of final cut. Vertical holes provide smoothly sheared highwall for future augering.

LOADING SCENE includes 3½-yd diesel-powered shovel loading 15-ton end-dump trucks, which carry coal 6 mi to tipple. Bulldozer and grader clean top of coal.

BACKFILLING is a two-shift job for new bulldozer equipped with turbocharger and 16-ft rock blade. Company expects to move 300 cu yd of spoil per hour with the unit.



SUPERVISORS include Clyde Newton (left), office manager; Nels Hunnicutt, coal loading foreman; John Fennel, stripping foreman; and M. H. Busby, superintendent.

then follows the road and drills blastholes on 15-ft centers. An average of 500 ft of hole is drilled in a shift. Horizontal drills are operated by two men and vertical drills are operated by one man.

Horizontal holes are charged with 350 to 500 lb of du Pont or American Cyanamid 40% dynamite. Vertical holes are deck loaded with 350 lb of explosive, which is concentrated in the hard limestone and sandstone layers. Primacord is used in all blastholes and a millisecond - delay connector is placed in the blasting circuit between the horizontal and vertical holes. The short delay between the two groups of holes, with the horizontal going first, produces a smoother highwall which is desirable for augering operations. An average shot includes 12 horizontal and 14 vertical holes and usually is set off every other day. The company prefers to set off the smaller blasts because of the rapidly changing conditions in the overburden. A maximum of 50,000 cu yd of shot bank is kept ahead of the stripping units. It takes 1 lb of explosive for each 6 cu yd of overburden to get the fragmentation necessary for good digging.

UNCOVERING THE COAL

Stripping is carried out in two separate pits with draglines. Each of the units digs its own working bench as the first step in uncovering the coal. A Page 726 equipped with a 150-ft boom and swinging a 13½-cu yd bucket works in the No. 1 pit. Powered by a Page diesel engine, this walking dragline moves an average of 250,000 cu yd of material per month while working 24 hr per day, seven days per week. Stripping is carried out as follows with the 13½-yd machine:

After the highwall is blasted, the dragline heads into the broken material and digs its own working bench. This usually is made about 105 ft wide so that the machine can be maneuvered easily while removing the lower portion of the overburden. When the working bench is completed there is 40 ft of broken rock remaining on the coal. The dragline then is swung around and moved into position to remove the lower portion.

The second dragline is a crawler-mounted Lima 2400 with a 110-ft boom and a 6-cu yd bucket. This machine moves 125,000 cu yd of overburden per month in the No. 2 pit. However, the second unit tackles the shot bank somewhat differently than the larger unit. After a 75-ft working bench is dug, the dragline moves close to the highwall and digs a key cut parallel to the highwall and down to the coal. Then it moves out on the bench to a position between the key cut and the spoil bank and removes the remainder of the overburden.

LOADING THE COAL

To prepare coal for loading, a three-step cleaning process is carried out. First a bulldozer pushes the remaining larger material to the edge of the spoil bank. Then a motor grader scrapes the top of the coal immediately before it is loaded. Any of the fine material missed by either of the two machines is removed by hand.

Coal loading is assigned to a Marian 93M diesel-powered shovel equipped with a 3½-cu yd dipper. Operating only on the day shift, the shovel alternates between the two stripping pits. A P&H 855 diesel shovel fitted with an Amsco 3-cu yd dipper is maintained as a spare unit and to perform miscellaneous work, such as, cleaning up around the augers or road building.

AUGERING

Two Compton Model 56 highwall augers provide balance and flexibility in the Tasa operation. Operating only on the day shift and in separate pits, these machines produce 30% of the Tasa output. A single row of 48-in holes is bored to a maximum depth of 180 ft. The hard nature of the coal permits holes to be drilled on close centers with only 1 ft of solid coal between them.

Each auger is manned by four men whose duties are as follows: auger operator; hydraulic operator; bulldozer operator; and utility man. Average output per shift from each auger is 500 tons. The peak production for any one shift was 700 tons.

An Allis Chalmers HD 20 bulldozer is teamed with the auger to move it along the highwall and also to perform miscellaneous cleanup work in the pit. The P&H shovel also is called on for any cleanup work that can't be handled effectively by the bulldozer.

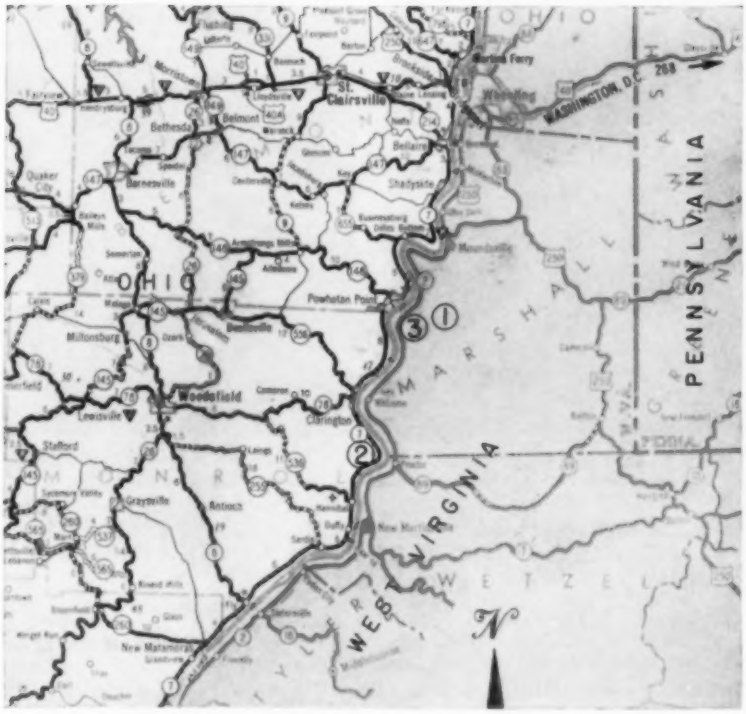
RECLAIMING THE LAND

When stripping and augering are completed, the pit is backfilled with spoil which is sloped to the highwall. A D9 Caterpillar tractor with a 16-ft rock blade works exclusively on backfilling. The company expects to be able to move 300 cu yd of material per hour with the new bulldozer which was purchased in December, 1955.

HAULING THE COAL

A fleet of 35 hired trucks serves the two augers and coal shovel. Hauling an average of 15 tons each, these units carry coal 6 mi to the crushing and screening facilities on the B. & O. R. R. Part of the trip is over company roads built on the spoil banks while the remainder is made on the highway.

New producer in aluminum, capable of evaluating plant sites and energy sources all over the nation, chooses the Ohio Valley and coal.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WEST VIRGINIA
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St. Clairsville
Woodsfield
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Bethesda
Belmont
Bellaire
Shadyside
Powhatan Point
Miltonsburg
Lewisville
Stafford
Graysville
Antioch
Clarington
New Martinsville
New Matamoras
Moundsville
Wheeling
Glen Dale
Cameron
Sherrard
Littleton
Cairo
Dallas
Oak Hill
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Cameron
Marshall
Wetzel
Monroe
Noble
Belmont
Harrison
Tyler
Ritchie
Doddridge
Gilmer
Barbour
Taylor
Monongalia
Marion
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Monongalia
Marion
Harrison
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Ritchie
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Pleasants
Wood
Wirt
Jackson
Roane
Calhoun
Gilmer
Braxton

GEORGE H. LOVE, president, Pittsburgh Consolidation Coal Co.

THOMAS S. NICHOLS, president, Olin Mathieson Chemical Co.

PHILIP SPORN, president, American Gas & Electric Co.

Leaders in development of coal's entry into another industry

oxide of aluminum. The 2 lb of alumina, mixed with a mineral catalyst called cryolite, is treated electrolytically to produce 1 lb of aluminum. In these proportions, production of the pound of aluminum requires about 9 kwh of DC electrical energy. Present aluminum consumption is 1,500,000 tons a year for a long list of products ranging from kitchen pots to railroad trains.

To help fill the portion of this need that will be supplied by the Olin Mathieson plant, Pitt Consol, through its Hanna Coal Co. division, is working on the early development of a deep mine having an initial capacity of 2,000,000 tons per yr to serve two 225,000-kw generating units. One of these will supply power to the Olin Mathieson plant and the other will supply power over AGE lines to other consumers.

The new mine will discharge coal from a slope adjacent to the power plant near Cresap, W. Va. Substantial expansion of the entire venture is contemplated, with the output of the mine increasing accordingly. Coal reserves presently assigned to the mine amount to 120,000,000 tons, and it is expected that 600 men will be employed underground and on the surface. George McCaa, formerly general manager of Jamison Coal & Coke Co., a Pitt Consol subsidiary, has been named general manager at the new mine.

Capital investment in the mine and the associated coal-carbonization facility will be about $20,000,000. Preparatory work is beginning now in the development of the mine, and work on the other projects will follow along as construction schedules are developed.

The coal-processing techniques to be used are those developed by the research and development division of Pittsburgh Consolidation Coal Co., headed by Joseph Pursglove Jr., vice president.

Leaders in the development of this newest bulk market for coal are George H. Love, president, Pittsburgh Consolidation Coal Co.; Thomas S. Nichols, president, Olin Mathieson Chemical Corp., and Philip Sporn, president, American Gas & Electric Co.

"There is every reason to believe," Mr. Sporn says, "that the Olin Mathieson project will be followed by still further developments in the Ohio Valley in aluminum and other chemical, electrochemical and electrometallurgical operations which require large quantities of economical power.

"From the standpoint of coal itself, the new carbonization plant will provide a more economical fuel in the form of char and a new source of usable chemicals from coal—a unique development, the full impact of which will take some years to make itself felt. Fundamentally, its significance lies in the upgrading of coal into the chemical field while providing a source of lower-cost fuel for electric-power generation. Coal is here being given a double lift—a strong beginning in its fight to enter the chemical field in an area now dominated mostly by natural gas and oil, and an improvement in its competitive struggles in the power field presently against the same fuels and, in time, against nuclear fuel," Mr. Sporn said.

CHOOSING A SITE

Selection of the site, coming after many months of searching and after dozens of locations had been carefully studied, was based upon these factors:

1. The location is adjacent to large deposits of high-quality coal which make possible an almost unlimited supply of low-cost power.

2. The center of the aluminum buying market is nearby.

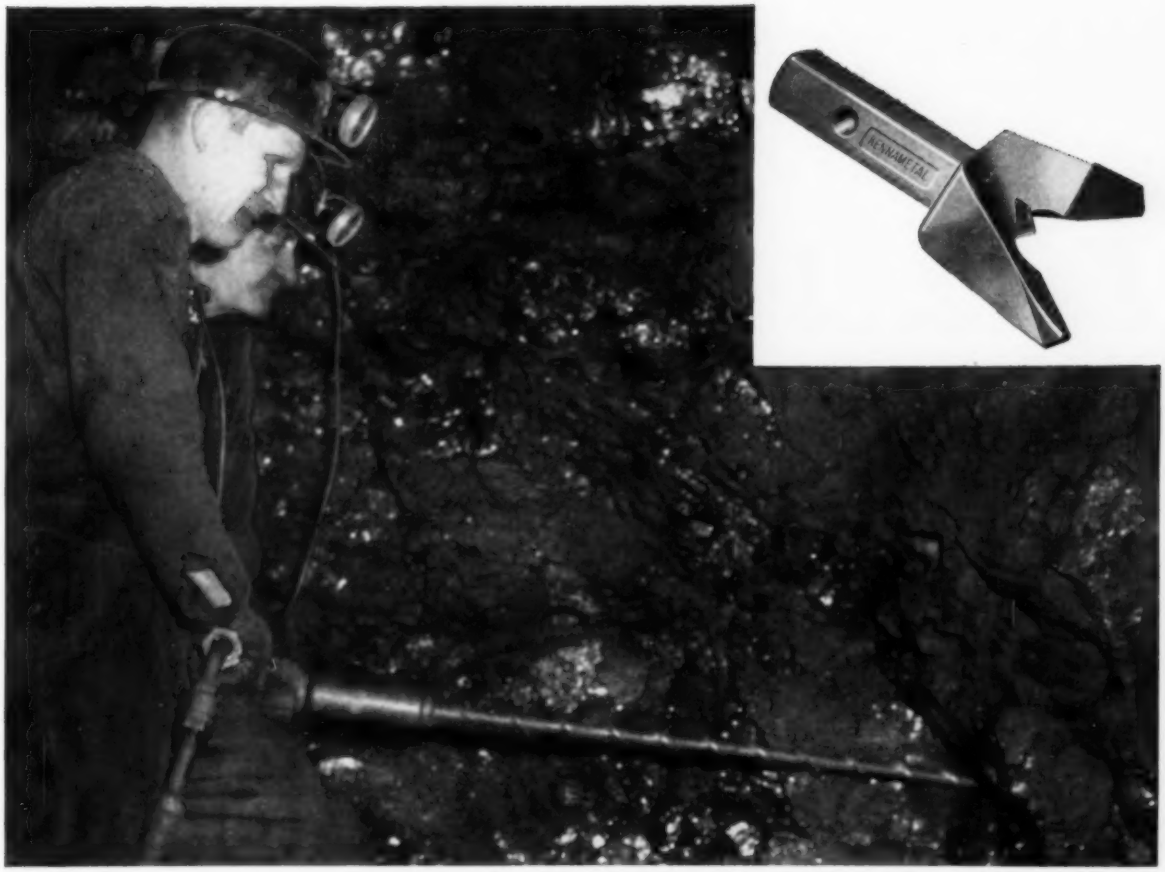
3. Deep-water transportation is available.

4. East-coast ports are readily accessible by rail.

5. Easy shipment of alumina and aluminum out of the area as well as receipt of bauxite at the plant are facilitated by these rail- and water-shipping possibilities.

6. Sufficient acreage for future expansion is available.

The plants are being built under certificates of necessity from the United States government issued in order to help increase the supply of primary aluminum. But one of the brightest features of the development is the boost it will give the economy of the Tri-State area, including eastern Ohio, western Pennsylvania and northern West Virginia and the Panhandle section of that state.



Switch to rotary drilling with Kennametal* Bits cuts drilling time by 75%

improves production cycle . . . lessens fatigue of drillers . . . reduces dust, vibration and noise . . . increases safety

The Problem: Mining anthracite coal in Bottom Red Ash seam, which is from 5 to 6 feet thick with hard bands of bony, slate and sulfur pyrites. Face preparation requires drilling 10 to 12 holes 7 feet deep. Using percussion drills, the drillers worked two tiring hours on each face drilling cycle. Excessive dust, vibration and noise made the whole working area uncomfortable.

Solution: A switch was made to Kennametal DLC-1¾ drill bits and Kennametal twisted Shank Augers on rotary air drills.

Ask about the complete line of KENNAMETAL drill bits, cutter bits, roof bits, augers, pinning rods, accessories

INDUSTRY AND
KENNAMETAL
. . . Partners in Progress

RESULTS:

Drilling time was cut from 2 tough hours to ¼ or ½ hour. One crew drilled a face in the amazing time of 11 minutes. Drillers are less fatigued; and since noise, vibration and dust have been reduced, the whole working area is more comfortable and a safer place to work. The crews are safer, more productive workmen.

Whether it is drilling in problem areas or in clean coal, you will find a Kennametal Drill Bit to do the job fast, with low bit and maintenance cost and long bit service. Ask your Kennametal representative to show you these bits. Try them in your mine. KENNAMETAL INC., Mining Tool Division, Bedford, Penna.

*Registered Trademark

FOREMEN'S FORUM

—*Wide World Photo*

GERALD KNAPP (above) of Blair Academy, leaps to victory in the running broad jump event at a prep school track meet. Gerald engages in athletics with a praiseworthy purpose in mind. But there are forms of . . .

Lethal Athletics:

Leaping to Conclusions, Lifting Out of Context

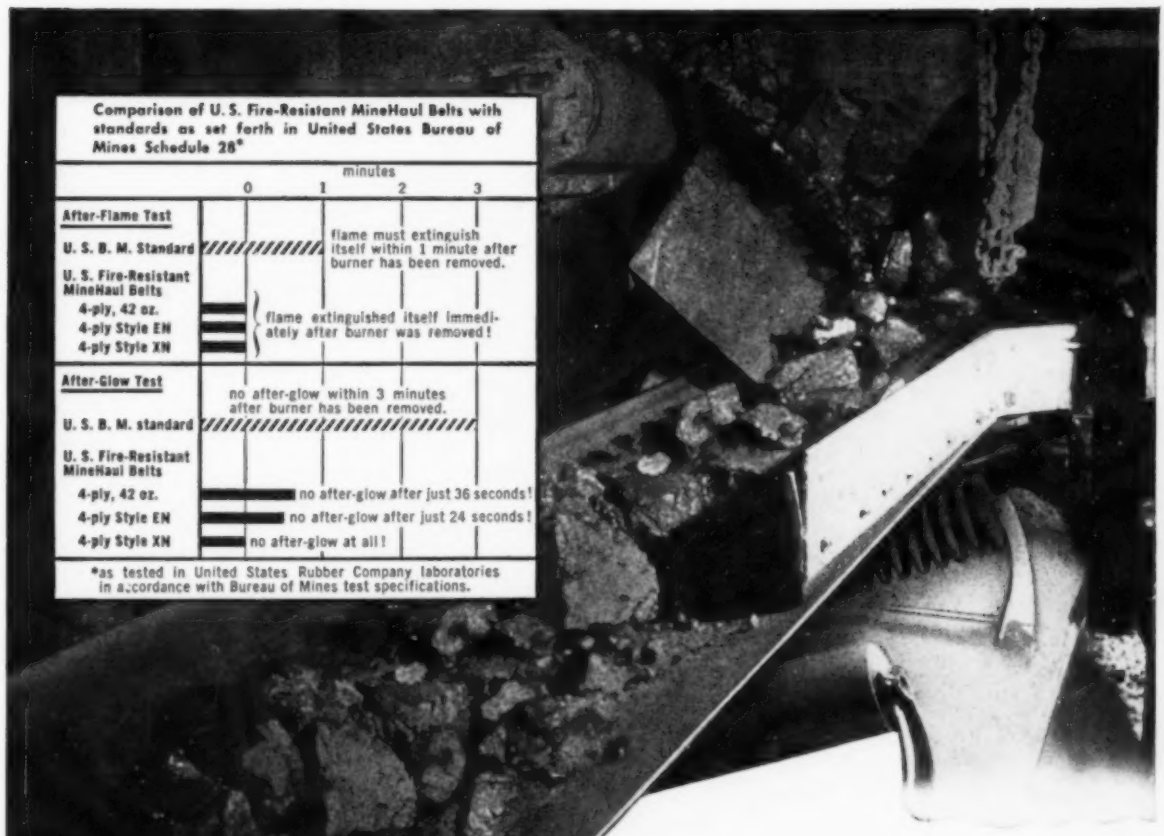
Both are dangerous habits which can introduce some troublesome complications into supervision. Mine bosses must exercise self-discipline to avoid the pitfalls of short thinking and snap judgment.

ONCE THERE WAS A MAN who awoke very early every morning. He was up and about before the crack of dawn. After some time he announced to all who would listen that he knew what made the sun rise. He said, "The crow of the cock in the morning makes the sun rise. I know, because every morning I hear the cock crow, and soon after I see the sun coming up."

This is a ridiculous example of short thinking followed by long leaping to distant conclusions. It is a practice that should be avoided like the plague by everyone, particularly by those who bear extra responsibility, such as supervisors.

The habit has come to be known as *post hoc* thinking. *Post hoc* is a Latin expression, which loosely translated means: After this; therefore, because of this. One event has been observed to follow another event, making it quite

Now ready for installation!



Comparison of U. S. Fire-Resistant MineHaul Belts with standards as set forth in United States Bureau of Mines Schedule 28*

minutes
0
1
2
3
After-Flame Test
U. S. B. M. Standard
flame must extinguish itself within 1 minute after burner has been removed.
U. S. Fire-Resistant MineHaul Belts
4-ply, 42 oz.
4-ply Style EN
4-ply Style XN
flame extinguished itself immediately after burner was removed!
After-Glow Test
no after-glow within 3 minutes after burner has been removed.
U. S. B. M. standard
U. S. Fire-Resistant MineHaul Belts
4-ply, 42 oz.
no after-glow after just 36 seconds!
4-ply Style EN
no after-glow after just 24 seconds!
4-ply Style XN
no after-glow at all!

*as tested in United States Rubber Company laboratories in accordance with Bureau of Mines test specifications.

U. S. Fire-Resistant MineHaul Belts

U. S. Rubber's *Fire-Resistant* MineHaul Belts have already been given the United States Bureau of Mines' acceptance designation: "Fire Resistant, U.S.B.M. No. 28-5."

These belts are the result of an extensive development program carried on by U. S. Rubber to provide the mine operator with underground conveyor belts that offer *maximum* fire resistance. In fact, the new U. S. *Fire-Resistant* MineHaul Belts EXCEED the Bureau of Mines specifications, as the chart above shows.

And, naturally, these new belts have all the added features built into all "U. S." conveyor belts: optimum troughability, high impact resistance, outstanding rip resistance, excellent fastener holding ability, added edge protection—to name a few.

Contact any of the 27 strategically located "U. S." District Sales Offices or write us at Rockefeller Center, New York 20, N. Y.

US RUBBER

Mechanical Goods Division

United States Rubber

convenient to state that the latter event is a direct result of the former, even though there may be no connection whatsoever between the two. Legitimate effects should not be coupled to unrelated causes. The temptation to do so confronts most of us, and it takes careful, patient analysis of any problem or observation to avoid the pitfall.

Having disciplined ourselves to refrain from leaping to absurd conclusions, we must learn to keep an eye on the other fellow. He may in all innocence feed us a line of *post hoc*. If he presents it in palatable form, it may be mighty easy to swallow. But if it is a proposal on which some important follow-up action must be based, you can be sure it will lead to acute pain in a very short time.

This kind of reasoning isn't always easy to detect, and only a very small percentage of it is offered maliciously. It is important for these reasons, therefore, that any man critically scrutinize all the information that comes to him, especially if he holds a job in which he must make decisions based on that information.

So much for this shortcoming. Let's turn our attention to another habit that can lead to disastrous consequences. Then we shall return later to a discussion of how these two shortcomings can complicate the life of a mine supervisor.

The second shortcoming concerns the habit of trying to build an airtight case on limited information. We sometimes read a certain fact within the body of a larger piece of information, and we say, "I believe this without reservation." This is known as "lifting out of context." It is a reprehensible habit if done intentionally. And it can cause trouble even if done innocently. Here is an example:

". . . Police had orders to shoot on sight. Thousands of citizens were roaming the streets, plundering, pillaging, burning, killing. Public gatherings were canceled. . . ."

Not knowing where these words came from, one's imagination may conjure pictures of a riot in a blood-and-thunder novel, the Bolshevik revolution or similar events in fiction or history. Actually, the words describe recent riots in Bombay. They were written by Billy Graham, the evangelist, as part of a larger story that hangs together and comes to the point that "India is hungry, searching, questing, deciding." Imagination is grand, but it should be controlled in any search for solid facts. All pertinent articles or reports should be read in full in simple justice to the writer.

You have heard the adage, "The devil can quote the Bible to serve his purposes." He is able to do this because he is quite willing to resort to "lifting out of context"—maliciously, we might add. Now you see how terrible the habit can be.

Why are these matters of great importance to foremen?

We think we can show how they might have a direct influence on the very lives and happiness of the men who work for you.

Let's return to the matter of leaping to conclusions, and in making our point let's focus our attention on the roof-fall accident problem.

One of the most dangerous leaps to a distant conclusion lies in the practice of jabbing the roof with a metal bar and pronouncing it good roof. We often wonder whether or not the tester has made up his mind on the safety of the roof before he sounds it. Sometimes the action appears to be so automatic, casual and habitual that we who stand aside under our burden of photographic equipment are led to wonder whether the test is really valid.

Furthermore, the term "good," as it applies to mine roof, is a highly-relative rating. How good? . . . that is the question. Records of the Bureau of Mines show that men have been caught under large pieces of roof, some of them large enough to emit a pleasant thwack when tested with a metal bar. Complete reliance on such tests is the sort of long dangerous leap we speak of.

The roof-fall accident record is anything but reassuring. Responsibility for improving the record presses most heavily on supervisors. If a standard timbering plan has been adopted, it is up to the mine supervisors to achieve complete, strict compliance.

Faith is a sublime human emotion. We recognize that sometimes it is necessary to base some of our conclusions on faith. However, mine roof does not deserve our faith. Don't trust the roof, support it. This should be the lesson instilled in the men by their immediate supervisors.

Now with a slight change of direction we take up the matter of lifting out of context, with its supervisory implications. The question of which is worse, breaking a man's head or breaking his spirit, is debatable. Most of us, we think, would accept an undeserved physical blow with better grace than an undeserved assault upon our best motives. Viewed in this light, lifting out of context appears to have some influence in the human-relations aspects of a supervisor's job.

Proceeding against a man on hearsay or by picking apart his utterances in search of damning scraps is not an edifying way to handle employee relations. You would be lifting out of context should you attempt to do so.

This is the big reason why a supervisor should practically knock himself out in getting all the facts as he investigates a complaint or a budding grievance. Fairness demands that the man making the complaint receive a full hearing. Then he has a right to a solid decision as soon as one can be formulated.

In arriving at such a decision, a foreman is well-advised to refrain from prejudging the case on limited facts. It is so easy to believe a single fact that strikes our fancy while ruling out as evidence more relevant information. Being a victim of snap judgment is a bad experience. Don't exercise that kind of judgment on your men.

Developing leadership abilities in ourselves is not merely a matter of absorbing a store of set information nor of mastering a certain number of techniques. There is also a demand for the kind of mental discipline that helps a man restrain his own natural tendencies to leap to conclusions or lift out of context. Having mastered these requirements of his job, the supervisor is a credit to his profession.

The Spring Rains...

Within a few days Spring will arrive—Oh, Happy Day! The long-gray winter has run out its string. Soon the afternoon sun will be warmer, the dirt in the garden patch will look good and smell better and the daylight hours will stretch out noticeably. The birds will . . .

- Let's get down to business. Heavy Spring rains can bring problems to unprepared properties. Strip-mine operators and supervisors should take special pains to prepare a loading site somewhere above the lowest point in the pit. The lower coal can be recovered in the dry periods further ahead.

- Haulage roads should be shaped up by cutting new ditches where they are needed and resurfacing with rock if that is indicated. Portable pumps should be inspected and repaired, since they may be needed at a moment's notice.

- In deep mines, certain sections may have unusual drainage problems right now. Top operating management should be informed of these conditions in order that plans may be made for handling sudden inflow. In anthracite mines it is quite common for ground water to show up in the workings within a few hours after a heavy rainfall. Plans should be made now to handle this water.

- Settling basins on the surface also may need some care and repair. Downpours may weaken retaining dikes to the place where silt can escape into public streams. Don't be caught napping on this one.

Getting back to the birds, the neighbors tell us that if you want wrens and other desirable species about the place you should put out small birdhouses with tiny doors. If you like clinging birds, like nuthatches and woodpeckers, don't put perches on the houses and feeders. These birds don't need them, and the lack of perches will discourage starlings, bluejays and other querulous fellows.

How to *speed* your coal

...from pit

...on haul

...to tipple

Truax-Traer Coal Co. of Fiatt, Ill., gets a lot of work out of six CAT* DW20 Tractors and Athey PH20 Coal Haulers. Each DW20 makes the 3.4-mile haul, with an average load of more than 45 tons, and returns to the pit in 20 to 25 minutes. Here are some of the reasons for this fast and cost-cutting performance:

Easy loading, fast starting. At the pit, the short wheelbase of this Caterpillar-Athey unit means good maneuverability and small turning radius. The short, wide hopper makes a good shovel target. And the new 300 HP Caterpillar Diesel Engine with Turbocharger provides plenty of power to get big loads rolling quickly.

Fast, safe hauling. On the road, the Caterpillar DW20 can highball at 32.1 MPH. Traction and stability are excellent, thanks to low center of gravity and concentration of weight over the driving wheels. Air-boosted clutch, hydraulic-assisted steering, good visibility and comfortable bucket seat keep drivers fresh and at peak efficiency.

Clean, quick dumping. This agile, easy-handling unit gets into position quickly. Large bottom doors dump clean and fast, and can be precisely controlled. High top speed and traditional Caterpillar ruggedness and freedom from down time complete the picture for fast cycle times.

Your Caterpillar Dealer will give you the full story on the new DW20. See him soon, and count on him for skilled service and parts you can trust.

Caterpillar Tractor Co., Peoria, Illinois, U.S.A.

CATERPILLAR*

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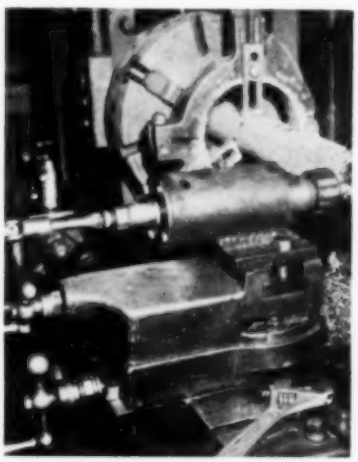
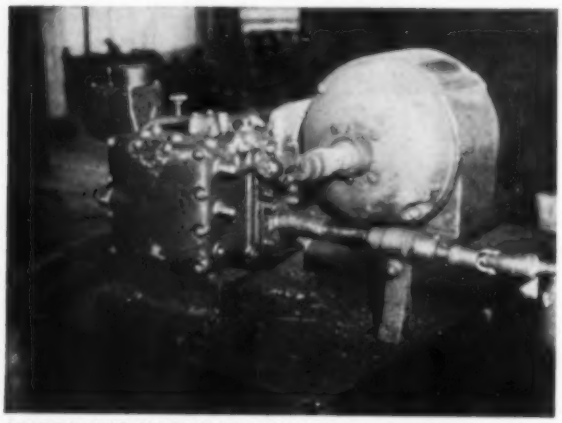
**NAME THE DATE...
YOUR DEALER
WILL DEMONSTRATE**

OPERATING IDEAS



CUTTING KEYWAYS in a shaft while it is in the lathe is done accurately with device designed by H. S. Pickens (left photo), machinist, The Colonial Coal Mining Co. Right photo shows housing head with chuck clamped to lathe.

Cutting Keyways on Shaft in Lathe



HYDRAULIC MOTOR driven by 2-hp motor powers device.

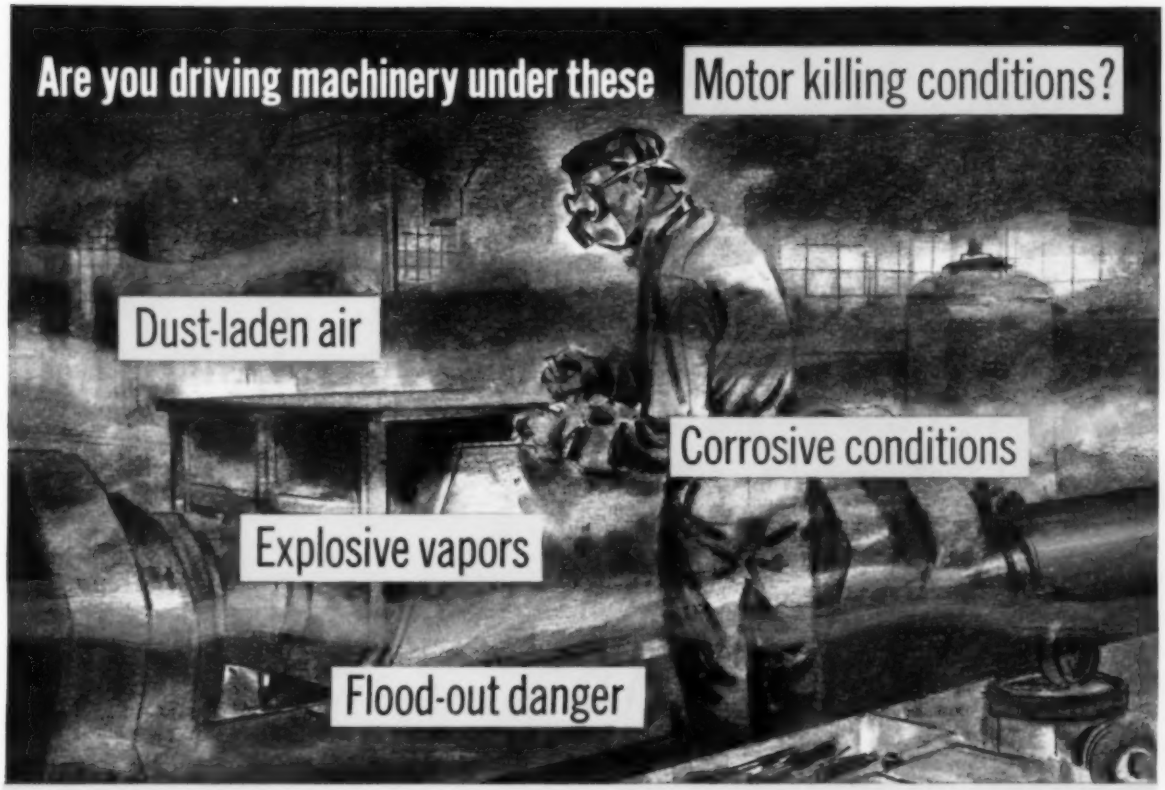
AN UNUSUAL PIECE OF EQUIPMENT for cutting keyways on shafts without removing the shaft from the lathe after it has been turned to size has been developed by H. S. Pickens, machinist, The Colonial Coal Mining Co., Madisonville, Ky.

The principal part of the equipment consists of a war surplus hydraulic motor used for revolving 40-mm anti-aircraft guns. Power is transmitted from the motor by means of a ½-in steel shaft with two universal joints that turn the chuck mounted in the housing head. The hydraulic motor is powered by a 2-hp motor. Both motors are mounted on a portable table made from steel plate and pipe and equipped with casters so it can be moved in and out of position easily.

The housing head is made from a 3-in double-strength pipe welded to a base plate. The base plate is drilled and mounted on the compound rest of the lathe and the double-strength pipe is bored to fit Timken roller bearings. The bearing is held in place in the housing by a nut at the front end and a cap at the rear end. The front end is threaded for the nut, and the rear end is drilled and tapped in four places so that the cap can be bolted in place. The spindle, which has a No. 4 Morse taper, is made from cold-rolled steel and is fitted in the Timken roller bearings. A collete chuck is held in place by a draw-in bolt which is drilled and tapped to take the drive shaft that turns the chuck mounted in housing head.

The equipment can easily and quickly be placed in position for operation. After the shaft has been turned to size, it is locked with the steady-rest. The table is moved in position near the lathe and the housing bolted to the lathe compound rest. The hydraulic motor makes it possible to operate the cutters at variable speeds. Small cutters are operated at faster speeds than larger cutters. Keyways from 1/16 in to 1¾ in may be accurately cut with the equipment and experience has shown it will cut keyways up to 1 in. as rapidly as a milling machine.

Coming in the next issue . . . OPERATING IDEAS explaining in text and a simple diagram how to make and apply a safety block to hold continuous-miner cutting chains motionless while changing bits and others that may help you solve a pressing problem. Share your ideas for better mining by sending them to The Editor, *Coal Age*, 330 West 42nd St., New York 36, N. Y. *Coal Age* will pay for the ideas you submit. A freehand sketch and full details on a leaf from your pocket notebook will be perfectly acceptable.



This New BJ Mechanical Drive Motor solves these problems!

Where difficult operating conditions make the use of a conventional open-wound motor either extremely impractical or hazardous, your best answer is the BJ Mechanical Drive Motor. Designed for the most rigorous use, this totally enclosed motor is filled with oil and mechanically sealed to make it impervious to *any* external condition. There is no possibility of sparking, corrosive attack, flooding out or "loading up." If you are driving machinery in mining, milling, refining or other industrial applications where these "motor killing" conditions exist you owe it to yourself to investigate the BJ Mechanical Drive Motor. It is a proven product of Byron Jackson's more than 20 years experience in the design and manufacture of oil-filled, sealed electric motors.

The BJ Mechanical Drive Motor is available in sizes from 5 to 450 HP, 4 pole, and can be supplied to meet the special torque or horsepower and speed requirements of any particular application. *Write for special BJ Mechanical Drive Motor information.*

BJ

Byron Jackson

Division of Borg-Warner Corporation

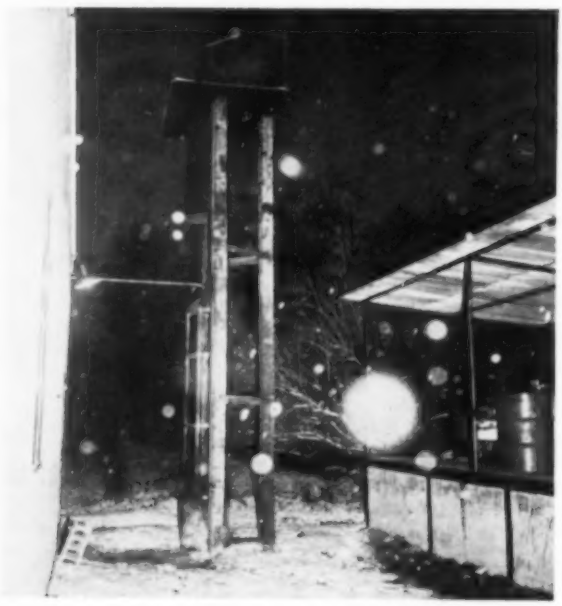
P. O. Box 2017A, Terminal Annex

Los Angeles 54, California

SAFETY SUGGESTIONS are heard by men in shaft elevator as they enter and leave Consol's No. 93 mine in West Virginia.

Recorded Safety Messages Alert Workers

RECORDED SAFETY MESSAGES are delivered to workers as they descend at the start of the shift and as they return after a day's work at Mine 93 of the Consolidation Coal Co. (W. Va.), Monongah, W. Va. Five seconds after the door is closed and the elevator is on its way, a 30-sec safety message is automatically announced to the riders by an MSA Message Repeater unit located in the elevator. Two different 30-sec messages are recorded on a 60-sec two-stop tape in the unit. The first, or down message, applies to men starting their underground work and is played as the elevator descends. The second, or up, message stresses safety after leaving the mine and is played as the elevator returns to the surface. Installed on December 1, 1955, the unit has been warmly welcomed by all employees. Messages are changed weekly to keep interest at a high level. There is one speaker inside the unit housing and a second one was added outside to increase the volume in the elevator. Changing messages is a simple operation and is done as follows. A switch on the unit is thrown and a microphone is plugged in. Then the new message is spoken into the microphone and recorded on the tape. The old message is erased automatically as the new one is recorded on the same tape, thus making possible fast message changes.

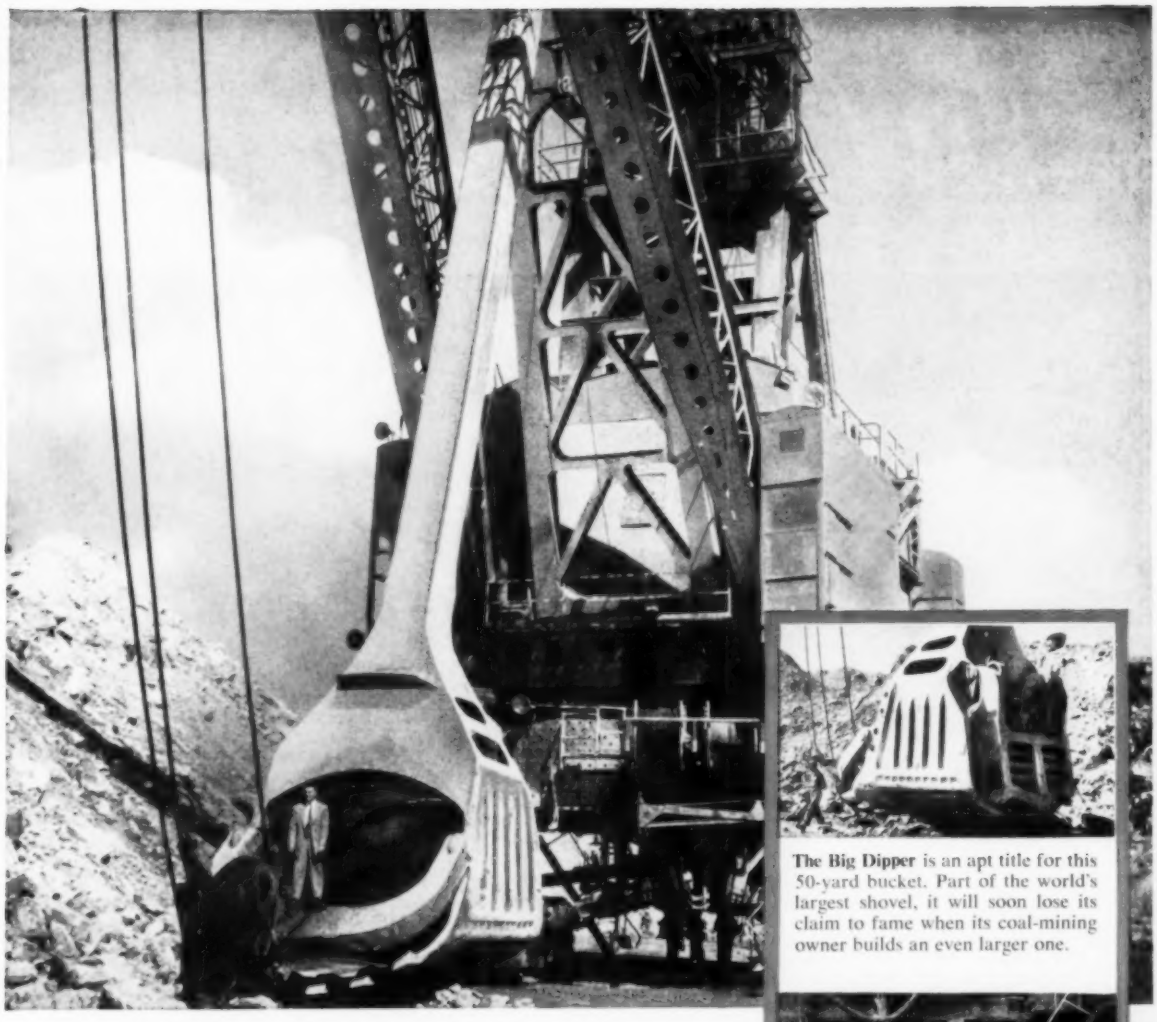


Borehole Speeds Supply

FAST DELIVERY of repair parts to the underground shop, elimination of the need for two supply houses and better control over supplies are benefits resulting from lowering supplies through a borehole near the underground shop at Mine 93 of the Consolidation Coal Co. (W. Va.). Before the borehole, supply hoist and new supply house were added in August, 1955, at the Ministers Run portal, supplies had to be hauled 3½ mi underground. As a result, it sometimes took an hour or more to get a part delivered underground when there was a breakdown. Now it only takes a matter of a few minutes to call the supply house and have the part lowered to the underground shop.

The 30-in borehole was put down with a churn-drill and lined with 24-in casing, which was grouted into place. A circular steel cage was built to fit inside the casing and a steel head frame with a 5-ton hoist was placed over the hole. A sliding door in the surface structure permits parts to be placed on the cage and the door must be closed before the hoist can be operated. The borehole and cage are large enough to be used as an emergency escapeway.

If you have ever wondered what would happen if you took a photo with flash at night when snow was falling, the accompanying photo will be of interest. A *Coal Age* staffer was also curious when he snapped the photo after dark when snow was falling. The white spots are snowflakes falling between the camera lens and the borehole.



Find the Cities Service Lubrication Engineer

Henry Zielasko, the Cities Service Lubrication Engineer in this picture, may look small, but he's no drop in the bucket in the operation of the world's largest shovel.

The reason: Henry supplies the gear lubricants—Cities Service Trojan L Compounds—for *all* the equipment owned by this giant mining company. And, to get the job, his Cities Service lubricants had to prove their superiority in rigid tests against those of every major competitor.

Henry, and the many other skilled Cities Service Engineers like him, are prepared to prove the merits of themselves and their products to you in the same manner. Put them to the test! Call your nearest Cities Service office, or write: Cities Service Oil Co., Sixty Wall Tower, New York 5, N. Y.

CITIES SERVICE

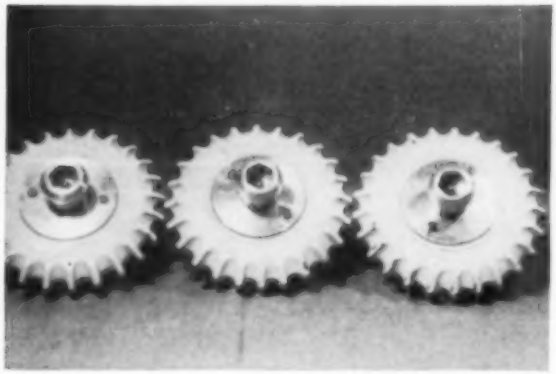
QUALITY PETROLEUM PRODUCTS

The Big Dipper is an apt title for this 50-yard bucket. Part of the world's largest shovel, it will soon lose its claim to fame when its coal-mining owner builds an even larger one.

Quiet, Cities Service at Work! In the mammoth gears beneath the shovel, Cities Service Trojan L Compounds give outstanding lubrication. They were chosen by the owner for all mechanized equipment.

Even the Trucks are Giants! Each big Euclid carries a 60-ton payload. Gear failure would be extremely costly. But that's no problem with Trojan L Compounds for lubrication.

EQUIPMENT NEWS



Replaceable Rock Bit Cones

A three-cone "Seismaster" rock bit for drilling strip mine and quarry blast holes is being sold by the Central Mine Equipment Co., St. Louis, Mo. The bit features replaceable cones, better protection for the cone bearings against abrasive bit cuttings and conventional lubrication fittings that permit frequent greasing of the bearings to flush out accumulated foreign matter and worn out grease.

The bit is especially designed for shallow drilling up to 250 ft. Thus it is returned to the surface at regular intervals. During rig-moving time the bit can be inspected and lubricated as needed. This regular cycle of lubrication is said to eliminate bearing breakdown and to prevent the cones from freezing in a fixed, dragging position.

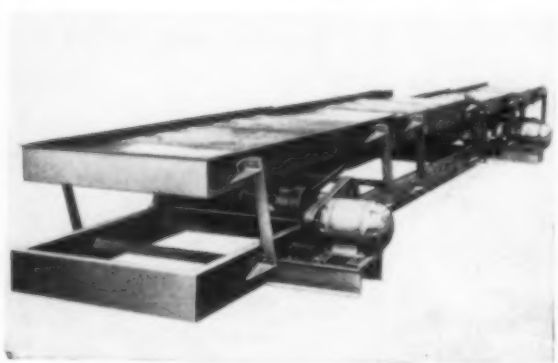
Because of this there is minimum hole diameter loss from the time a new set of cones is started until exhaustion. In cone-bit operation the principal cause of hole diameter loss is the breakdown of bearing members. This causes the cones to "skew" inward with less area touched by the cone cutting teeth. In turn excessive wear occurs as drag is created on the outside diameter of the bit body.

None of the moving bearing parts of the cone comes in touch with the leg of the bit body, since the bearing is separated by a retainer that eliminates all possibility of friction or abrasion on the inside of the bit leg. This further contributes to maintenance of full drill hole diameter by the "Seismaster," according to the company.

The teeth of worn cones could be built up, re-hard-surfaced and hardened. But Central Mine Equipment Co. says it has found this neither economical nor mechanically and metallurgically sound. Hardsurfacing rod generally is made with low carbon steel to permit smooth metal flow in application. This type metal will not respond to heat treatment or case hardening processes, according to Central Mine Equipment Co. The result is that re-tipped cones, the company says, have a useful life of only 30 to 35% of a new replacement cone.

Development and test work, done in cooperation with officials and drill crews at the operations of Cadiz Mining Co., Cadiz, Ohio, have shown that the cones rotate freely in the body of the bit throughout the life of the cones and that cone changes can be made on the drill without removing the bit from the drill stem. In one test, the cones turned freely after 6,000 ft of drilling.

The "Seismaster" bit is available in 8½ and 8¾ in diameters. It will materially reduce the bit cost of drilling overburden, Central Mine Equipment says, since the bit body will accept six to ten changes of cones because of the expendable design of the cones and an improved bearing design.



Low Cost Screen Conveyor

Williams & Green, Clearfield, Pa., has announced the "Imco" balanced screen conveyor, which, the company says, permits the lowest initial investment cost possible for any screening or conveying operation. The company bases its claim on the construction of the conveyor, which is built without rigid mounting installations. It is designed to screen or coarse-size coal from ⅜ in and up. Built to operate from any existing power supply, the conveyors are available in standard sections for conversion to screens, conveyors, picking tables, sizing and scalping screens. Sections and models are furnished in combinations of screening surfaces and lengths suited for a particular job. The conveyors are made with structural steel plate.

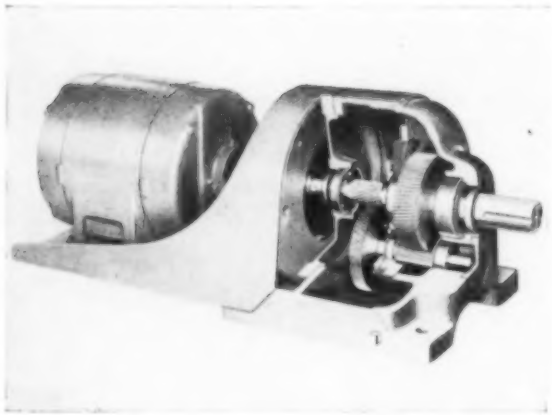
Where hole depth is less than 36", Chicago Pneumatic's RBD-30 Permissible Roof Bolting Unit can complete an entire roof-bolting cycle in 1½ minutes flat! In areas where deeper holes are required, CP completes the job in less than 3 minutes time.

The mobile RBD-30's low height gets it into low ceiling areas usually inaccessible to other machines. And the chuck is telescopic . . . can be adjusted 6" to meet roof irregularities. Built-in slip clutches prevent stalling . . . protect the drill and bolt setting motor. The Chicago Pneumatic RBD-30 is available with these extras: (1) water swivel attachment for wet drilling, (2) special low speed spindle attachment for slow speed drilling, (3) low seam drilling attachment for extremely low coal areas. Write for details. *Chicago Pneumatic Tool Company, 8 East 44th Street, New York 17, New York.*

CP drills hole and sets bolt

in 90 seconds!

Chicago Pneumatic
PNEUMATIC TOOLS • AIR COMPRESSORS • ELECTRIC TOOLS • DIESEL ENGINES • ROCK DRILLS • HYDRAULIC TOOLS • VACUUM PUMPS • AVIATION ACCESSORIES



For Heavy Duty Reduction

Link-Belt Co., 307 N. Michigan Ave., Chicago, Ill., has begun marketing new lines of heavy duty "Gearmotors" and "Motogears" said to deliver more horsepower per pound. The "Gearmotor," equipped with a rabbet-fit, flange-mounted motor, maintains positive and permanent alignment, Link Belt says. The "Gearmotor" flange is standardized, one size per motor, rather than two or more, to permit use of a more universally applicable motor. Type DF double reduction "Gearmotors" have ratios from 6.2:1 to 31.4:1 and transmit up to 30 hp. Type TF triple reduction models have ratios from 38.4:1 through 292:1 and transmit up to 20 hp. Link-Belt's "Motogear" is designed for applications destructive to ordinary gear drives and where heavy shock loads must be handled without damage. Rigidity of the "Motogear's" high-speed shaft and pinion is provided by a straddle-mounted pinion, which is designed to withstand shock, reversing and heavy loads. The motor can be replaced by removing four bolts. Type DB double reduction models have ratios from 6.2:1 through 38.4:1 and transmit up to 60 hp. Type TB triple reduction models have ratios from 47.1:1 through 292:1 and transmit up to 20 hp. The "Gearmotor" and the "Motogear" have output speeds from 280 rpm down to 6 rpm.

Time Saving Bit Design

A new design in tool bits manufactured for mechanical mining machinery has been announced by Kennametal, Inc., Latrobe, Pa. The bits are for use on coal cutting chains and continuous miners such as the Joy Continuous Miner, the Jeffrey Colmol and the Compton. Features: 1) Optimum clearance angles on radial cutting. On ripper cutting, additional clearance results in a smoother operation, the company says. 2) A straight line relief that places additional steel beneath the tip. 3) Less steel to remove during regrinding, thus a reduction in bit sharpening time.

Safety Design For Motor

Byron Jackson Div., Los Angeles 54, Calif., has announced a moisture-free, dust-free and explosion-proof electric motor for mechanical drive applications. Mechanically sealed, the motor is especially suited for mining in explosive atmospheres. It is made in models delivering from 20 hp to 450 hp. Since the entire motor is enclosed in a steel case filled with medicinally pure mineral oil of high dielectric strength there is little chance for sparking or for corrosive attack on internal parts. The mineral oil, an insulator, is said by the manufacturer, to be the "best" natural lubricant.

B.F.Goodrich

How tires last over 4,400 hours in rugged coal mining work

THE Carbon Fuel Company operates 40 units in its coal mining work in Kanawha County, West Virginia. Trucks haul slate, slag and other coal refuse, with loads often reaching 29 tons, over rugged mining roads. Tires take a terrific beating on a job like this.

But Carbon Fuel uses B. F. Goodrich Universal and Rock Logger tires, reports as much as 4,438 hours of service from them! Says Purchasing Agent W. M. Brackenridge, "They give us better traction and less down time."

B. F. Goodrich Universal and Rock Logger tires are specially compounded to resist rock cuts and bruises. The extra-thick tread has husky cleats that dig in and pull. And under the tread you can get the B. F. Goodrich *all-nylon* cord body. It withstands double the impact of ordinary cord materials, resists heat blowouts and flex breaks. No wonder the B. F. Goodrich *all-nylon* body outwears the tread, *can be recapped over and over!*

Why not follow the lead of mine operators all over the country and switch to B. F. Goodrich tires. See your nearby B. F. Goodrich retailer today or write *The B. F. Goodrich Co., Tire & Equipment Div., Akron 18, Ohio.*

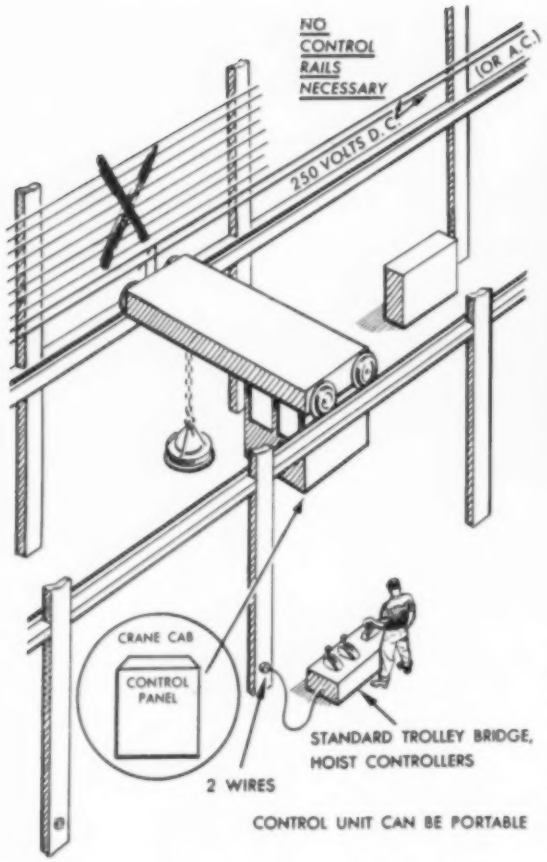
TONS OF SLAG pour onto this truck equipped with B. F. Goodrich Rock Logger tires at Carbon Fuel Co. mine near Carbon, W. Va.

"WE PREFER the Universal tread over any other," says Roy J. Ault, Superintendent of Shasta Coal Corporation, Bicknell, Indiana.

Specify B. F. Goodrich tires when ordering new equipment

RESEARCH KEEPS B.F.Goodrich FIRST IN RUBBER

Your B. F. Goodrich retailer is listed under Tires in the Yellow Pages of your phone book

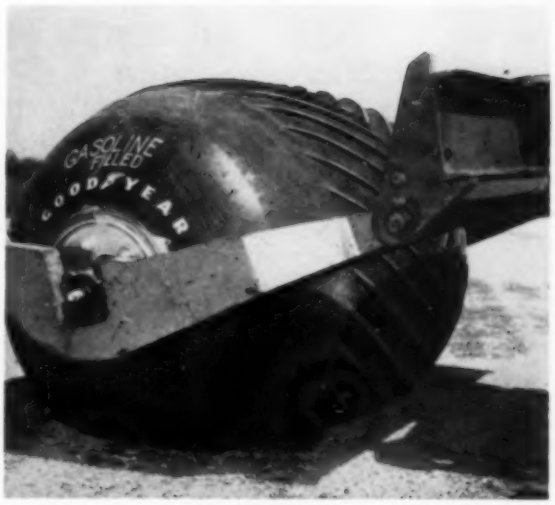


Traveling Crane Remotely Controlled

Femco, Inc., Irwin, Pa., has developed an electronic system designed to provide remote control over traveling cranes. Carrier current over existing power rails is the only circuit required. With the control an operator working from floor level can raise or lower a hoist, position a trolley forward or reverse, and energize or turn off a magnet. As many as eight cranes can be controlled on one power circuit says Femco, by using different carrier frequencies—and one operator can direct more than one crane. Floor control can be portable or permanent. An emergency stop switch is provided to cut off the carrier and open control contactors. High speed synchronous relays operate when control levers are moved. A "sealing-in" relay stores the signal until a new operating cycle changes it.

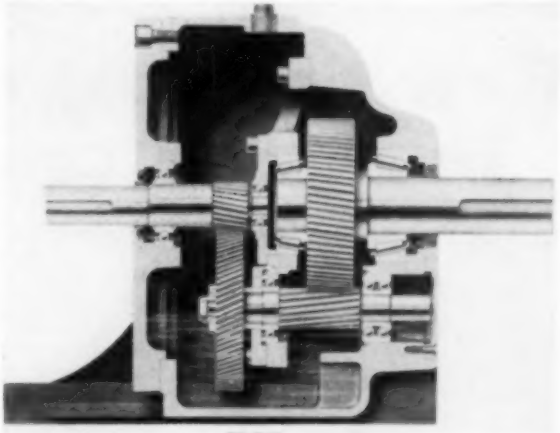
Preparation Plates For Fine Coal

Pyramid Screen Co., 30 Church St., New York, N. Y. has announced new specifications for conical-hole, perforated plates. The company lists these characteristics: 1) smaller holes, to .01 in in mechanical perforation and to .001 in in electrolytical perforation, 2) thicker plates that are double or more than double the diameter of the hole, 3) non-blinding, conical shaped holes, 4) new "Venturi," or hour-glass perforations, for backwash, 5) round, square and slotted perforations. Pyramid recommends the plates for fine-coal preparation and for resistance to abrasion, impact, pressure and vacuum. Standard size plate is about 39x39 in, but exact size requirements and continuous sheets can be prepared by the company. Pyramid offers samples and specifications, plus services of its engineering department to assist in developing special requirements. The company says its fabrication facilities are equipped to weld metals as thin as 0.0005 in.



"Watermelon" Tank Carries 250 Gal.

A watermelon-shaped rubber tank, the "Rolli-Tanker," is being manufactured by the Aviation Products Div., Goodyear Tire & Rubber Co. The container can be rolled over the ground, floated in water and dropped without bursting, the company says. Designed to meet liquid-handling problems, the tanks are actually unconventionally shaped nylon cord tires with a fuel-proof inner lining. Thus far Goodyear has tested 3½x5 ft tanks (weight 40 lb deflated) that hold 250 gal. The company says only 30 lb of drawbar pull is needed to roll the units. Low footprint pressures permit drawing them over unprepared, rough surfaces. When filled the inflated tanks can be floated across water.



Heavy Duty Helical Gear Drives

A series of in-line helical gear drives has been developed by the Link-Belt Co., 307 N. Michigan Ave., Chicago 1, Ill. Double reduction drives are available in ratios from 6.2 to 1 through 38.4 to 1, with capacities up to 118 hp. Triple reduction drives are available in ratios from 47.1 to 1 through 282 to 1, with capacities up to 20 hp. The gear drives are constructed of one-piece cast iron housings with oil seals located at shaft openings. To minimize space needs the company has placed input and output shafts in the same horizontal and vertical planes. Moving parts are permanently aligned and the pinion is straddle-mounted to take shock, reversing and heavy load, according to the manufacturer.

O-B Bail-Type Expansion Units

Go up easy.... and stay put!

- Most bolting crews notice a difference when they switch to O-B Bail-Types.
- O-B Bail-Types "go up easy" because the bail allows shell fingers to flex against the sides of the hole—adjusting without difficulty to minimum hole diameters and slight irregularities.
- O-B Bail-Types "stay put" because deep serrations on four shell fingers bite into the hole wall in four directions at the slightest downward pressure—you never have to hold the bolt up while you get a wrench on it.
- And once an O-B Bail-Type is completely installed, it expands and penetrates four ways into the hole, building up a solid metal "socket" that resists roof pressures without pinching bolt threads and impeding bolt recovery.

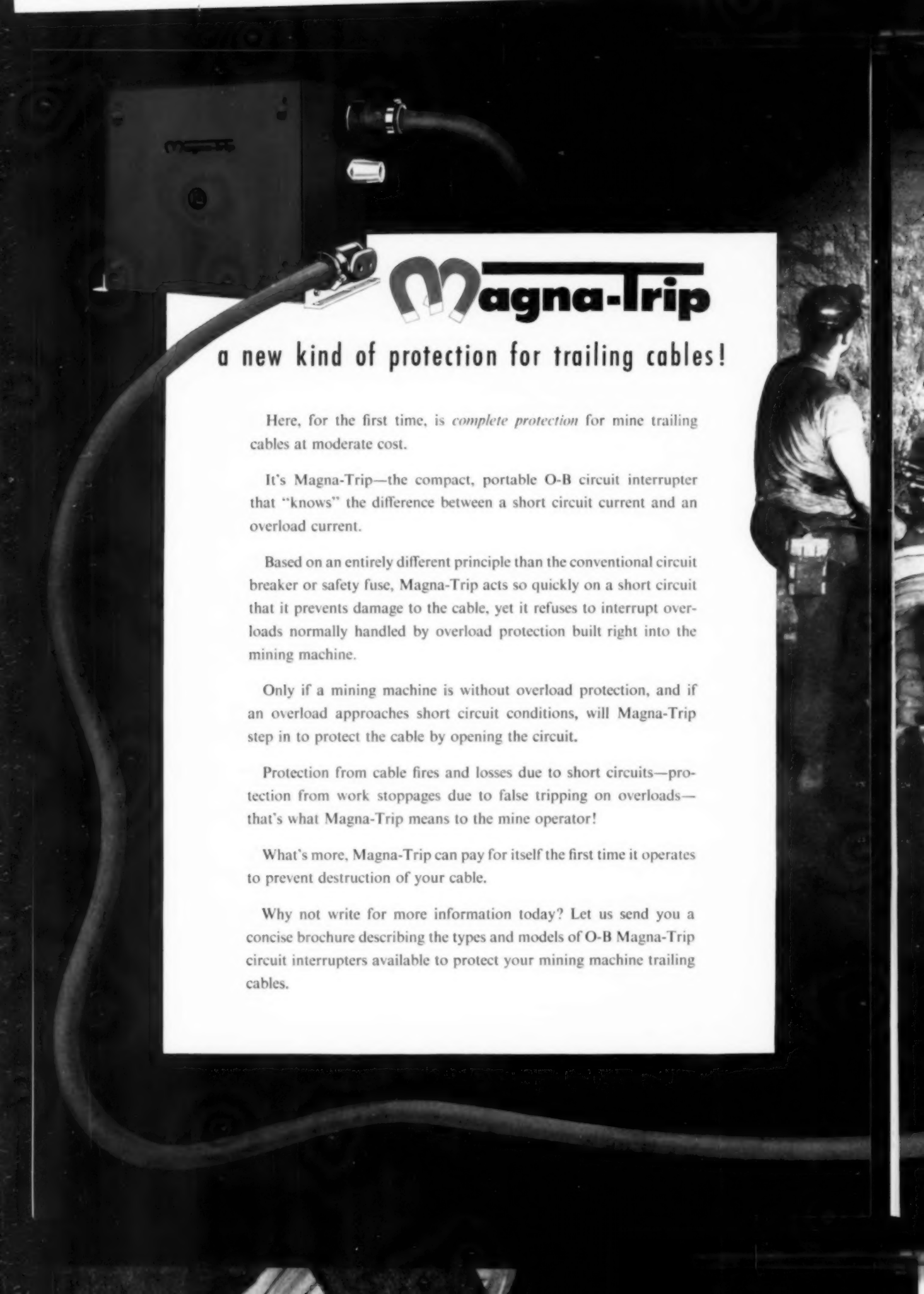
Ohio Brass

MANSFIELD OHIO, U. S. A.

IN CANADA: CANADIAN OHIO BRASS CO., LTD., NIAGARA FALLS, ONT.

Feeder and Trolley Materials • Control Materials • Trolley Shoes
Roof Bolt Shells and Plugs • Rail Bonds • Automatic Couplers

For use with ¾-inch bolts, order Catalog 22378
For use with ⅞-inch bolts, order Catalog 22463



Magna-Trip

a new kind of protection for trailing cables!

Here, for the first time, is *complete protection* for mine trailing cables at moderate cost.

It's Magna-Trip—the compact, portable O-B circuit interrupter that "knows" the difference between a short circuit current and an overload current.

Based on an entirely different principle than the conventional circuit breaker or safety fuse, Magna-Trip acts so quickly on a short circuit that it prevents damage to the cable, yet it refuses to interrupt overloads normally handled by overload protection built right into the mining machine.

Only if a mining machine is without overload protection, and if an overload approaches short circuit conditions, will Magna-Trip step in to protect the cable by opening the circuit.

Protection from cable fires and losses due to short circuits—protection from work stoppages due to false tripping on overloads—that's what Magna-Trip means to the mine operator!

What's more, Magna-Trip can pay for itself the first time it operates to prevent destruction of your cable.

Why not write for more information today? Let us send you a concise brochure describing the types and models of O-B Magna-Trip circuit interrupters available to protect your mining machine trailing cables.

Ohio Brass
MANSFIELD
OHIO, U. S. A.
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Feeder and Trolley Materials • Control Materials • Trolley Shoes
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Power

at your fingertips!

- It's no bigger than the palm of your hand, yet this O-B Rail Clamp carries up to 400 amps all day long without overheating—and does it when clamped to scale and rust covered rail, too!
- Attaches to rail by means of a "built-in" wrench fastened right on the head of the heat-treated set screw through which contact is made.
- Swivel action allows high-strength aluminum-bronze handle to turn 180 degrees then flop over to continue tightening—forcing cup-shaped tip of set screw into positive contact with "bright" metal of rail.
- Bronze cable connection holds cable sizes from No. 14 to 2/0. Clamp itself fits on base of any rail up to 100 pounds.
- Order Catalog 22461.

Ohio Brass

MANSFIELD OHIO, U. S. A.

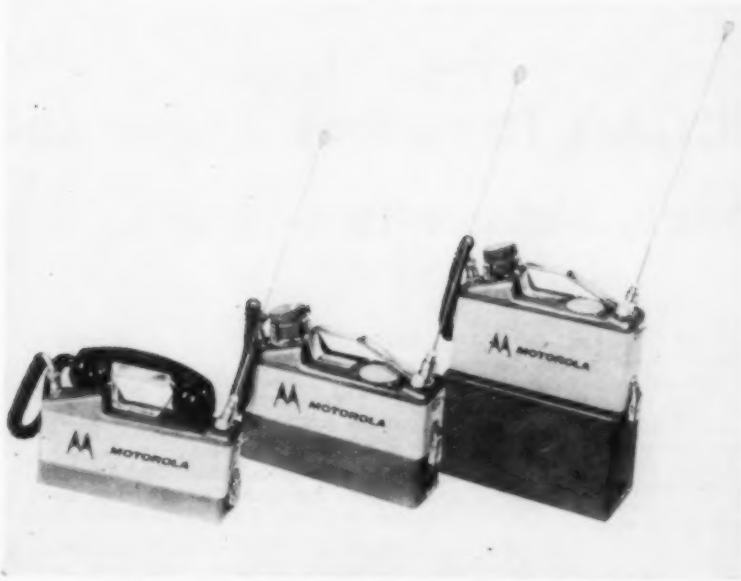
IN CANADA: CANADIAN OHIO BRASS CO., LTD., NIAGARA FALLS, ONT.

Feeder and Trolley Materials • Control Materials • Trolley Shoes
Roof Bolt Shells and Plugs • Rail Bonds • Automatic Couplers

4702-M

Hydraulic Control Over Working Positions

Two new motor graders equipped with torque converters and full-shift transmissions, the 140-hp Huber-Warco 7-D and the 100-hp-6D, have been announced by Huber-Warco Co., Marion, Ohio. The transmissions, the maker says, permit quick shifts under full load and wide-open throttle. Features: hydraulically operated power sliding moldboard; hydraulic control over every working position; bank-sloping angle to 90 deg; blade rotation to 180 deg without removing scarifier teeth. Construction design: all-welded frame with high-arched design.

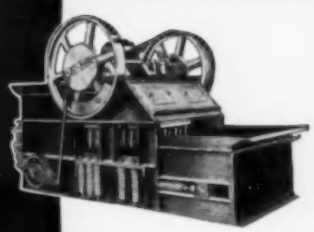


Portable Radiophones Transistor-Equipped

A new line of transistor-equipped, portable two-way radiophones with RF power ratings from 1 to 8 w has been announced by Motorola's Communications & Electronics Div., 4545 W. Augusta Blvd., Chicago, Ill. The lightest model weighs 7 lb 9 oz; one 8-w model weighs 15½ lb. Featured is a snap-on power pack. Dry cell, wet cell and 117-v, AC, power packs are interchangeable. The wet cell pack employs nickel-cadmium cells, 6 or 12 v. Available in 25-54 mc and 144-174 mc frequencies, handset or speaker-palm microphones.

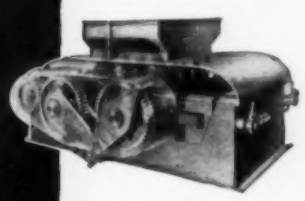
America's most complete line of CRUSHING EQUIPMENT

AVAILABLE FROM STOCK AND ON SHORT DELIVERY



McNally Norton Vertical Pick Breaker

50% less fines when reducing lump to egg and stove sizes.



McNally Double Roll Gearmatic R. O. M. Breaker

Built in tonnage ranges from 750 tph to 1400 tph. Full floating Gearmatic drive.

McNally Gearmatic Stoker Coal Crusher

This unit offers three prime advantages:
High volume production, plus accurate sizing, plus low percentage of fines.

McNally Single Roll Crusher

Universal application. 20", 24" and 36" dia. rolls.

For immediate action on complete information write, wire or call . . .

M

★ Pittsburg, Kansas ★
★ Wellston, Ohio ★

1 **Side wear eliminated.** Ideal in coals that core.

2 **Smooth, free cutting action.** Tip has full nose radius.

3 **Cleaner cutting action.** Tip on top, and maximum clearance on shank, make cutting cleaner, easier.

4 **Easier to change.** Removal notch reduces time and work in bit changing; reduces maintenance costs.

5 **No jamming.** Stop assures accurate position and maximum hold; prevents bit from being jammed into sprocket.

6 **No bending or breaking.** Heat-treated, forged steel shank gives maximum resistance to deformation.

New Carboloy CCA-1 Recovery Auger Bit cuts cleaner, sharpens easier

In the roughest going, the new Carboloy® CCA-1 will get maximum tonnage from recovery augers . . . using a minimum of power and pressure.

Two major advantages:

1. **More tonnage per tool**
   - increased output per grind
   - more grinds per tool
   - elimination of chipping, breaking, and side wear
   - cuts faster, smoother, freer
2. **Lower maintenance costs**
   - longer tool life
   - easier to change
   - easier to sharpen

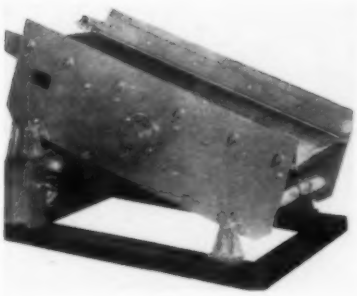
This versatile bit can also be used with equal success in continuous miners or cutting machines using standard ½" x 1" bits.

Like all the tools in the complete Carboloy line, the CCA-1 is ready for immediate delivery from your Authorized Carboloy Mining Tool Distributor.

For price lists, specifications, or expert assistance on carbide mining tool problems, call your local Carboloy Distributor – you'll find his name listed on the opposite page.

"Carboloy" is the trademark for products of the Carboloy Department of General Electric Company

CARBOLOY
DEPARTMENT OF GENERAL ELECTRIC COMPANY
11120 E. 8 Mile Road, Detroit 32, Michigan



Screen's Speed Boosted

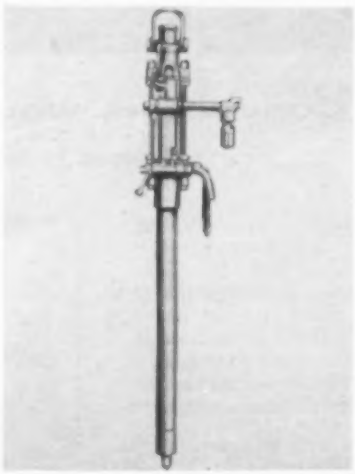
Hewitt-Robins, Inc., Stamford, Conn., has announced a high speed vibrating screen said to be 30% to 80% faster than previous mechanical screens. Designed for fine materials, the screen has a speed of 3,300 rpm when set for a ½-in stroke, 2,400 rpm when operating on a 1/16-in stroke. Maximum speed in the past, according to Hewitt-Robins, has been 1800 rpm. The company has also included what it says is a new lubricating technique. Atomized oil is injected under pressure into the bearings as a fine mist. The mist, says Hewitt-Robins, prevents overheated bearings, a situation encountered at high speeds with conventional grease and lubricating oils. The screen is called "HS Vibrex" and is designed for use with screen cloth of 10 to 80 openings per lineal inch.

Charger Heats Battery

Fox Products, Co., Philadelphia, Pa., says it has a battery heater-charger that can overcome difficulties that turn up when lead acid storage batteries are operated at very low temperatures. Since a battery's electrolyte restricts the escape of hydrogen gas that has been generated during charging at low temperature (thus damaging the battery), Fox has adapted the idea of using the battery itself as a heat source to eliminate the effects of freezing temperatures. With the Fox heater-charger, alternating current is passed through a battery by attaching the heater directly to the battery's terminals. The heat generated in the battery, says Fox, is directly proportional to the battery's AC resistance, since internal resistance increases as a battery becomes colder. Thus, says Fox, heating becomes more efficient at low temperatures. The company's unit is designed for use with 6 or 12 v batteries and can be set to (1) maintain batteries at even temperatures automatically and indefinitely, (2) charge batteries at a preselected rate, and (3) simultaneously and automatically heat and charge at a proper rate.

Bit Detacher Modified

Le Roi Div., Westinghouse Air Brake Co., Milwaukee, Wis., has modified its BD-282 bit detacher. The detachers are used to remove "one use" bits from drill steel and are being manufactured now with a plate covering the bit and the end of the steel. Le Roi calls this a safety improvement over former models, since the detacher can be operated only when its cover is in place.



Lighter, Faster Stoper

A lightweight stoper said to be capable of drilling faster than heavier models, is being sold by the Le Roi Div., Westinghouse Air Brake Co., Milwaukee, Wis. Designated the "S-10," the stoper weighs 79 lb when used with a 26-in feed. Le Roi says it reaches its faster cutting speed because of an end seating valve that permits a more powerful blow on rotation. Optional equipment includes a "U-Shaped" steel puller that swings on a pinion and can be released to exert pressure downward against the shoulder of stuck steel. The "S-10," itself, operates on 70 to 90 lb of air pressure and is available with 26, 32, and 38-in feeds. Air hose diameter is ¾ in, water hose ½ in.

Hose Assembly Fitting

A "no-skive," reusable fitting designed to ease making up hydraulic hose assemblies in which rubber-covered wire braid is used, has been developed by the Parker Appliance Co., 17325 Euclid Ave., Cleveland 12, Ohio. The fitting consists of a socket and a nipple and does not require the hose cover to be stripped off, according to the company. Assembly is accomplished in two steps, Parker says:

AUTHORIZED CARBOLOY MINING TOOLS DISTRIBUTORS

Carboloy Mining-Tool Distributors

Your local Carboloy Mining-Tool Distributor is listed below. His complete stocks guarantee you *immediate* local delivery.

ALABAMA
Birmingham 2—Shook & Fletcher Supply Co.

COLORADO
Denver 17—Mine & Smelter Supply Co.

ILLINOIS
Mt. Vernon—Central Mine Supply Co.

INDIANA
Terre Haute—The Mine Supply Co., Inc.

KENTUCKY
Harlan—General Electric Supply Co., Div. of General Electric Distributing Corp.
Harlan—Kentucky Mine Supply Co., Inc.
Madisonville—Central Mine Supply Co.

NEW YORK
Buffalo 23—Austin Ford Logan, Inc.

OHIO
Cambridge—Cambridge Machine & Supply

OREGON
Portland—J. E. Haseltine & Company

PENNSYLVANIA
Johnstown—General Electric Supply Co., Div. of General Electric Distributing Corp.
Pittsburgh—General Electric Supply Co., Div. of General Electric Distributing Corp.
Washington—Fairmont Supply Co.

TENNESSEE
Knoxville—Crowell Engineering & Sales Co.
Knoxville—W. J. Savage Company

TEXAS
El Paso—El Paso Saw & Belting Co.
El Paso—Mine & Smelter Supply Co.

UTAH
Salt Lake City 1—Mine & Smelter Supply Co.

VIRGINIA
McClure—Erwin Supply & Hardware Co.

WEST VIRGINIA
Bluefield—Bluefield Supply Co.
Bluefield—Rish Equipment Company
Charleston—Rish Equipment Company
Clarksburg—Rish Equipment Company
Fairmont—Fairmont Supply Company
Montgomery—Marathon Coal Bit Co.
Shinnston—Erwin Supply & Hardware Co.

CARBOLOY
DEPARTMENT OF GENERAL ELECTRIC COMPANY
Detroit 32, Michigan

What Electrical Connectors would you choose ...for these installations?

Modern mining techniques allow little time for coddling men or equipment . . . so it's a safe bet your answer to the question in our headline will be based on more than just the electrical requirements of the equipment. Such important considerations as safety, efficiency, durability and maintenance cost, will influence your selection. *This is as it should be and we're glad it's true* . . . for the mining industry's constant search for the best available equipment has made JOY Electrical Connectors their preferred choice since 1928.

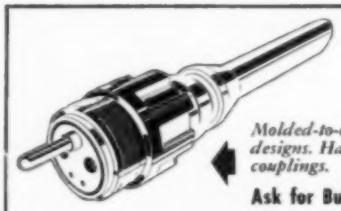
Why settle for less . . . when the best costs less in the long run?

JOY plugs and receptacles are specifically designed to provide long-range, maintenance-free service under the most adverse operating conditions . . . and they're available in styles and sizes to meet every mining need. Two of the currently *most popular* designs for mining installations are illustrated at right. Equipped with non-corrosive metal couplings and flame-resistant Neoprene bodies, both are moisture-tight, shatter-proof and distortion-resistant.

Straight Pin Bigun (SPB)—Have threaded metal couplings. Plugs are factory-vulcanized to 36" cable leads or to lengths as specified. See Bulletin B39a for complete information.

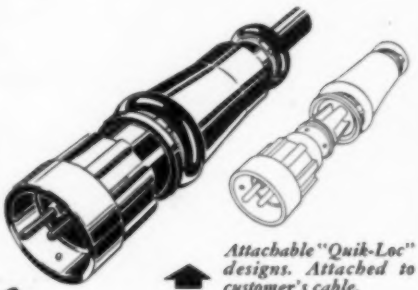
Attachable "Quik-Loc" styles—Attach quickly to customer's own cable. Newly designed couplings completely engage or disengage in ¾ turn. See Bulletin B57 for complete details.

JOY plugs and receptacles are available for both AC and DC applications. In addition, "SPB" and "Quik-Loc" connectors may be supplied with pilot control contacts for *permissible operation* when used in conjunction with JOY'S Bureau of Mines-Approved distribution centers (SCC units). Ask us for complete information, ***Joy Manufacturing Company, Henry W. Oliver Building, Pittsburgh (22) Pa.*** In Canada: *Joy Manufacturing Co. (Canada) Limited, Galt, Ont.*



Molded-to-cable "SPB" designs. Have threaded couplings.

Ask for Bulletin B39a.



Attachable "Quik-Loc" designs. Attached to customer's cable.

Ask for Bulletin B57.

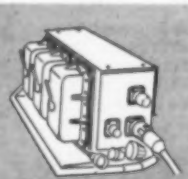
WAD CD5447

Consult a Joy Engineer

JOY

SPECIALISTS IN CREATING ELECTRICAL CONNECTORS FOR MINING AND INDUSTRY SINCE 1928

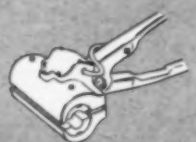
Write for information on these JOY products



Safety Circuit Centers

Distribution Boxes

Portable Lighting



New Cable Vulcanizer

(1) the hose is rotated into the socket counter-clockwise and (2) the nipple is screwed clockwise into the hose and socket. The first thread of the socket cuts through the hose's rubber cover to permit the remaining threads to contact the wire braid. Named "Hoze-Loc," the line is offered in four different connecting ends.

EXPANDED GAS
OUTLET (CLOSED)
FILTER CAKE . . . broken up by sleeve expanding under pressure of back-flow. Cake flows down to drain.
INLET (CLOSED)
DRAIN (OPEN)

Filters Chemicals, Water

A tubular filter, said to be useful for any water or chemical purification job, is being manufactured by The Industrial Filter and Pump Manufacturing Co. Named "Hydra-Shoc," the filter builds up air pressure at the end of a filtering cycle and then uses the pressure for a sudden back surge to clean the filter chamber. In operation, influent passes through the walls of perforated tubes covered with synthetic fabrics. In cleaning, the outlet valve is closed and pressure builds up on the air trapped inside. Then a pair of quick-opening valves simultaneously shut off the inlet and open the filter's drain. The compressed air dislodges filter cake, forcing it out of the drain.

Lab-Size Rotary Dryers

Hardinge Co., Inc., York, Pa., has introduced self-contained pilot-plant laboratory-size Ruggles-Coles rotary dryers. The units are available in three models and all are mounted on a structural steel frame. They require only fuel and electrical connections. Model XH-XF is a single shell direct heat, gas-fired dryer that can be arranged for parallel or counterflow operation. Model XB, a double shell, indirect, gas-fired rotary dryer, is said to be suitable for high temperature drying without contaminations. Model XC is a steam tube dryer for small capacity operations.

Truck Transmission

The first automatic transmission to be designed specifically for highway trucks, according to the company, is being manu-

dry MORE coal
at LESS cost

this is how
the PARRY DRYER
does it...

low initial investment
low operating cost
no service down-time
negligible parts replacement
flexible capacity
automatic control
continuous processing
maximum safety
high thermal efficiency
maximum fines recovery
compact arrangement

This turbulent entrainment process has been in service for 5 years. Surface moisture of washed coal is regularly reduced to 2% at rates up to 100 tons per hour. In processing lignite the inherent moisture has been reduced from 34% to 4% at rates of 50 tons per hour. Drying costs have been less than 20¢ per ton.

Operation is continuous and automatic. Feed is variable and control is precise. Any desired final moisture content is possible. Suitable for stream and washer fines as well as HMS overflow. Dryers with capacities of 250 TPH can be built.

WRITE FOR BULLETIN, FULL DETAILS AND PRICES

SILVER ENGINEERING WORKS, INC.
3313 BLAKE STREET • DENVER 5, COLORADO

DESIGNERS AND MANUFACTURERS OF
INDUSTRIAL AND PROCESS MACHINERY

We did it this way to give you a bigger and better look at this new mine vehicle that's boosting production! - slashing costs! - making history!

The self-propelled Lee-Norse MINE PORTAL BUS with the exclusive split-roof!

The answer to speeded up transportation for your section production crews is here at last! It's the new self-propelled Lee-Norse MINE PORTAL BUS with the split-roof.

Yes, for the first time a vehicle that actually holds portal to portal time to a minimum—boosting tonnage!—lowering costs!—saving money!

Here's why the Lee-Norse MINE PORTAL BUS leads—

- "Tailor-made" for your seam—your condition!
- Capacity varies from 14 to 20 men depending on available clearances in mine!
- Two independent braking systems for complete safety—disc brakes (airplane type) are smoothly operated by either hydraulic or mechanical means.
- Unique split-roof gives the driver unhampered sweep vision in all directions at all times—trolley pole is always within his easy and safe reach.
- Designed and built by the originators of the well-known Lee Norse JITNEY and the famous Lee-Norse MINER.

Let us show you how this BUS CAN PAY ITS WAY - write or call

Lee-Norse Company

Specialists in Coal Mining Equipment

CHARLEROI, PA.

factured by the Allison Div., General Motors, Indianapolis 6, Ind. The transmission is known as the CTP-4 Powermatic and will be installed in a forthcoming line of Chevrolet trucks. Self-contained, the CTP-4 is a torque-converter type. It has 6 speeds forward, 1 reverse and contains an oil-controlled hydraulic retarder for braking. The company says the retarder provides a braking force some 6 times greater than the force provided by engine braking. The heart of the transmission is a hydraulic control system which synchronizes all shifting sequences. Maintenance-wise, the transmission offers these features: no adjustment for wear or service; elimination of shock load damage to drive line components; and a steady flow of power from the converter.

Front-Mounted Body Hoist

Galion Allsteel Body Co., Galion, Ohio, has announced a line of front mounted single telescopic hoists for use with 8 to 15 ft bodies. Known as the "Uni-scopic" series, the hoists are said to have a greater lifting capacity than underbody hoists. The company also says that the hoists permit a substantial payload increase without violating highway weight laws. Because the hoists lift at the front of the body, bigger payloads can be shifted forward to load the front axle to its legal limit, the manufacturer says. Capacities range from 3 to 14 cu yd and 9 to 20 tons. Cylinder construction is three-stage with 5 or 6 in first-stage sleeves, depending on hoist capacity.

Private Radio Paging

A radio paging system designed for private individual paging, has been developed by Motorola Communications & Electronics, Inc., Chicago, Ill. Traded as the "Handie-Talkie," the low-frequency system consists of a selector consol with individual buttons for key personnel, an FM transmitter that radiates alerting tones and voice messages within a confined induction loop area and individual transistor equipped radio receivers. When a particular receiver has been alerted, no other receiver in the system can pick up either the alerting tone or a voice message. A receiver weighs 10 oz and is slightly larger than a pack of king-size

PLANTS AND MAGAZINES LOCATED IN THE HEART OF THE COAL INDUSTRY

Convenient locations of plants and magazines mean prompt, efficient service to AMERICAN'S customers.

Call on your AMERICAN representative for assistance on any unusual blasting problems.

THE AMERICAN *LINE*

High Explosives
Permissibles
Blasting Powder
Blasting Caps
Electric Blasting Caps
Instantaneous
Regular Delay
Split-second Delay
Blasting Accessories

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EXPLOSIVES DEPARTMENT
30 Rockefeller Plaza, New York 20, N. Y.

Sales Offices:
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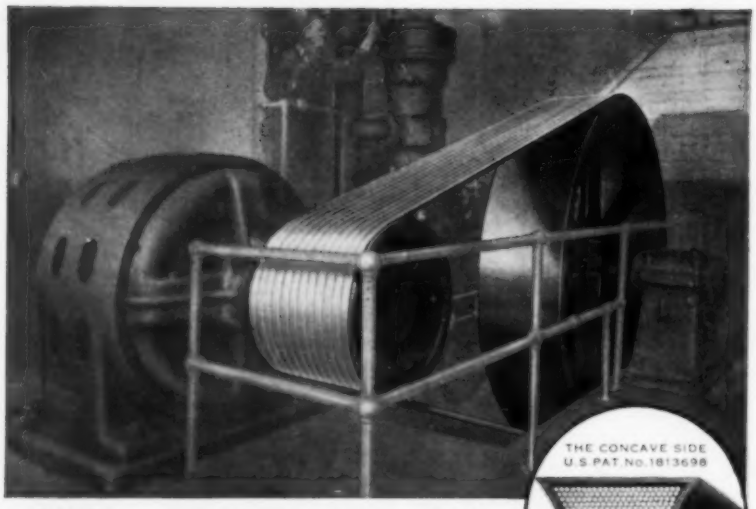
...If it's AMERICAN, it's dependable!



Why a V-Belt with CONCAVE SIDES wears longer

It is easy to demonstrate to yourself why the concave sides (Fig. 1) of the Gates belt greatly lengthen belt life.

Simply bend a Gates belt and feel the sides. Notice how these precisely engineered concave sides *fill out* on the bend and *become straight.* Thus a Gates belt grips the sheave groove evenly (Fig. 1-A) and wear is distributed uniformly across each side of the belt. That means longer belt life; lower costs.

Make the same test with a straight-sided belt (Fig. 2) and see what happens. The sides bulge out on the bend (Fig. 2-A) concentrating the wear at points shown by arrows.

To assure longer wear and keep belt costs down, specify the V-belt with concave sides—Gates Vulco Rope . . . readily available from nearby distributor stocks. The Gates Rubber Company, Denver, Colorado —*World's Largest Maker of V-Belts.*

There are Gates Engineering Offices and Distributor Stocks in all industrial centers of the United States and Canada, and in 70 other countries throughout the world.

Gates VULCO ROPE Drives

cigarettes. It is powered by a 4v mercury cell battery and is said to be immune to common interference. Motorola says that several hundred persons per system can be paged individually, the additional channel capacities being added as needed.

Hard Surface Protector

A pitch base bituminous resin of liquid consistency designed to protect macadam, concrete, asphalt and blacktop has been developed by the Stonhard Co., 1306 Spring Garden St., Philadelphia 23, Pa. Named "Stontreet," the resin is said to form a protective film that resists atmospheric acids, fumes and water penetration. The company recommends it for inside or outside areas that are usually wet. The resin produces a dry film, according to Stonhard.

Detects Carbon Monoxide

A pencil-size detector designed to measure any dangerous concentration of carbon monoxide is being sold by the Bacharach Industrial Instrument Co., 7301 Penn Ave., Pittsburgh 8, Pa. The instrument shows as low as 40 parts carbon monoxide per million parts of air according to Bacharach. Named the "Monoxor" tester, the unit comprises a replaceable indicator tube and an aspirator pump with connector for holding the indicator tube during a test. A chemical sensitive to the gas changes color when carbon monoxide passes through the indicating tube.

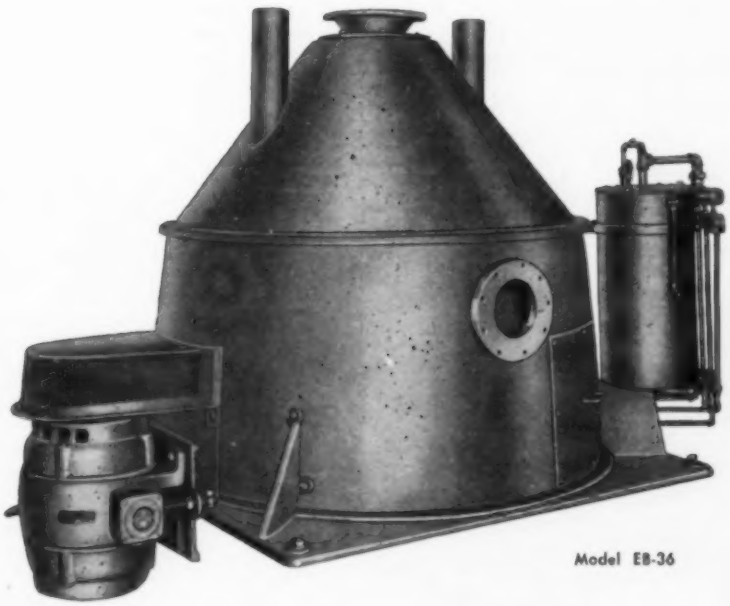
Device Cuts Radio Chatter

General Electric says it has removed the "distracting chatter of radio calls intended for others" by developing electronic tone selecting equipment for standard two-way radios. The tone equipment, according to GE, turns on mobile radio receivers individually and allows a dispatcher to communicate, for instance, with any radio equipment car or truck without contacting other radio equipped vehicles in the network. General Electric calls the system the "Personal Channel." It permits the same radio range as before and avoids complicated circuits. Transmitter signal strength is not lessened, according to the company. The three basic parts needed for applying "Personal Channel" to a standard radio system are: (1) a dispatcher unit, (2) a tone receiver chassis, and (3) a tone transmitter chassis.

(*Continued on p. 110*)

C·M·I

CONTINUOUS CENTRIFUGAL

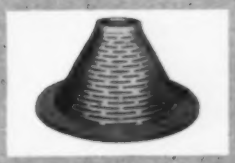


Model EB-36

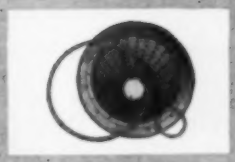
Economy and efficiency are combined to make C·M·I Centrifugal Dryers leaders in their field. The unprecedented basket design of this dryer provides greater capacity together with economy of operation. The coal is dried to a 6% surface moisture content without the use of expensive heat-drying operations. Increased resistance to shock loads is provided by the new V-belt direct drive, while clogging, and resulting clean-out jobs, are nearly eliminated by an enlarged and improved discharge channel.

The new C·M·I dryer provides savings in daily operation expense in addition to low installation costs. For only a few cents a ton, this dryer will actually earn extra profits for you through the reclamation of marketable coal from slurry ponds. C·M·I welcomes the opportunity to assist you with your particular problems in this field.

Model EB-36 is compact, requires little space, little headroom.



The heart of Model EB-36 is the revolving basket and inner cone.



Metal clamping rings make it possible to replace worn out screens merely by loosening a few bolts — an exclusive feature.

Production capacity assures prompt delivery of new equipment and replacement parts at all times.

CENTRIFUGAL & MECHANICAL INDUSTRIES, INC.

146 PRESIDENT STREET — SAINT LOUIS 18, MISSOURI

C·M·I Centrifugal DRYERS

THE LAST WORD IN SCREENING EFFICIENCY

The word's out on wedge wire and ***Hendrick has it!***

That's right. With the addition of new Hendrick Wedge Wire, Hendrick now makes available a complete line of screens for the best in efficient, low-cost screening, dewatering and filtering operations. It's ideal wherever it is important that screen openings be minutely fine, have excellent draining qualities and a high degree of accuracy and rigidity. For details on how Hendrick Wedge Wire can best be applied to your specific requirements and afford tops in low-cost, efficient screening, call your nearby Hendrick Sales Engineer. He's listed in your local classified telephone directory under ***Perforated Metals.***

Hendrick

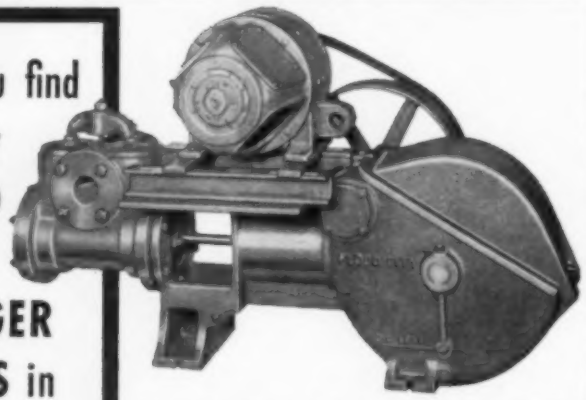
MANUFACTURING COMPANY

41 DUNDAFF STREET, CARBONDALE, PA.

Sales Offices in Principal Cities

Perforated Metal • Perforated Metal Screens • Wedge-Slot and Hendrick Wedge Wire Screens • Architectural Grilles • Mitco Open Steel Flooring • Shur-Site Treads • Armorgrids • Hendrick Hydro-Dehazer

Why you find so many FLOOD CITY PLUNGER PUMPS in use in the coal industry



This popular Plunger Pump, which uses the Flood City Reversible Water End, pumps efficiently even under the most difficult conditions. Built of heavy, acid-resistant bronze or stainless steel, easy maximum flow of water is certain at all times. A large, hinged cover on the completely enclosed power end allows quick access for inspection or repair of working parts. Self-lubrication via the crankcase reservoir keeps all moving parts working smoothly requiring a minimum of maintenance. The intermediate shaft rotates on roller bearings. Piston rod is shielded to prevent water from reaching the power frame.

Available in several sizes to handle as much as 100 GPM

Detailed information and prices for your particular pumping problem may be had at your request.

SERVICE FC FIRST

FLOOD CITY BRASS & ELECTRIC CO.

JOHNSTOWN, PA.

SALES AGENT: KANAWHA RAIL & MACHINERY CO. Charleston, W. Va.

Equipment Shorts

LIGHTWEIGHT COMPRESSOR — Worthington Corp.'s Tool Div., Harrison, N. J., has announced a 210 CFM compressor with a newly designed clutch and a separate oil reservoir equipped with a pre-heater to help cold weather starting. Cylinders are gravity drained to prevent "lock" and oil accumulation, according to the company, which says the machine, one of the "Blue Brute" line, is small, lightweight and efficient.

CONSTRUCTION LAMP — A new fluorescent construction lamp is being manufactured by the Luxo Lamp Co., Tuckahoe, N. Y. Made of light weight steel, the lamp is equipped with a variety of brackets that permit it to be clamped or mounted to flat surfaces or walls. Luxo says the lamp can be permanently or temporarily installed on desks, drawing boards or walls.

TRACTOR LOADERS — One-piece, box frame construction, high lift and high dumping clearances are features of new industrial loaders for Ford and "Fordson Major Diesel" tractors. Manufactured by the Tractor and Implement Div., Ford Motor Co., Birmingham, Mich., the loader's frame design permits an operator to step on and off a tractor between an upright member of the frame and the rear wheel rather than climbing over rear-attached implements. The Ford tractor loader will fit any NAA, 600 or 800 series tractor; the "Fordson Major Diesel" loader will fit any FMD tractor.

PORTABLE COMPRESSOR—Two-stage portable compressors and "Tractairs," manufactured by Le Roi Div., Westinghouse Air Brake Co., Milwaukee 14, Wis., are being made with deeper oil pans, according to Le Roi. The deeper pans are said to permit the equipment to operate in more rugged terrain. Portable compressor operations in angles up to 20 deg and "Tractair" operations at angles up to 25 deg more than double previous angles, the Le Roi Div. says.

LAB TABLE CUSHION — A solid polyethylene ribbed sheet designed for cushioning chemical apparatus in the laboratory is being manufactured by Palo Laboratory Supplies, Inc., 81 Reade St., New York 7, N. Y. Named the "Guth Handi-Mat," the sheet is made with a surface on which glassware can be drained, dried and stored. It is easily washed and rinsed according to the company, which recommends it for such surfaces as bench tops, desk tops, shelves, drawers and walls.

INDUSTRIAL VACUUMING—A heavy duty industrial vacuum cleaner, said to be lightweight, mobile and powerful, has been introduced by the Black & Decker Mfg. Co., Towson, Md. Traded as "No. 65," the cleaner is equipped with a 1¼ hp universal motor. The company says the cleaner will rapidly remove 3-¾ gal. of liquid or ⅞ bu of dry material before it becomes necessary to empty the ma-

MINE POWER FEEDER CABLE

TODAY'S TOP SPECIFICATION FOR MINE POWER DISTRIBUTION

NON-METALLIC ARMORED . . . shielded . . . Roebling high-voltage Mine Power Feeder Cable is perfectly adapted for practically every sort of power distribution requirement. You can suspend it vertically in shafts or boreholes; run it horizontally in underground entries or suspended from insulators. Since its outer sheath has high resistance to moisture, abrasion and other service hazards, you can safely bury it direct in shallow trenches.

Roebling Mine Power Feeder Cable has every construction feature that assures maximum safety, dependability and service life. Classified as semi-portable, it is exceptionally easy to move and handle under all conditions. Get complete information on Roebling Mine Power Feeder Cable from your Roebling distributor or by writing us.

Tinned copper shielding for extra safety... Bare ground wires, in contact with shielding, assure low resistance drainage to ground and act as a safety measure in event of machinery ground faults in the equipment.
Roeprene outside sheath has superlative resistance to heat, mine water, ozone and abrasion.
Conductors are covered with strand shielding tape to guard against internal corona cutting.
Rubber fillers in the interstices prevent wicking-in of moisture... provide a compact construction that resists abuse and increases flame resistance.
NG 3 CONDR. 5000V PIII E/M
ROEBLING

ROEBLING

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JOHN A. ROEBLING'S SONS CORPORATION, TRENTON 2, N. J. BRANCHES: ATLANTA, 934 AVON AVE. • BOSTON, 11-15 STILLING ST. • CHICAGO, 5525 W. ROOSEVELT RD. • CINCINNATI, 3253 FREDONIA AVE. • CLEVELAND, 13225 LAKEWOOD HEIGHTS BLVD. • DENVER, 4801 JACKSON ST. • DETROIT, 915 FISHER BLDG. • HOUSTON, 6316 NAVIGATION BLVD. • LOS ANGELES, 5340 E. HARBOR ST. • NEW YORK, 19 RECTOR ST. • ODESSA, TEXAS, 1930 E. 2ND ST. • PHILADELPHIA, 230 VINE ST. • PITTSBURGH, 1723 HENRY W. OLIVER BLDG. • SAN FRANCISCO, 1740 17TH ST. • SEATTLE, 900 1ST AVE. S. • TULSA, 321 N. CHEYENNE ST. • EXPORT SALES OFFICE, 19 RECTOR ST., NEW YORK 6, N. Y.

Transite
Mine Service Pipe

Stubbornly resists corrosion

MINE OWNERS AND OPERATORS have found from years of experience that Transite® Mine Service Pipe protects against frequent replacements due to corrosion.

Made of asbestos and cement, Transite is highly corrosion-resistant *all the way through*. It is strong and durable yet light in weight, easy to handle. Its Ring-Tite® couplings form joints that are flexible yet stay tight through the years. This flexibility permits conformance to the curves so frequently met in mine gangways.

For further information about Transite Mine Service Pipe and its use for mine drainage, water supply or other service write for Brochure TR51-A, Johns-Manville, Box 60, New York 16, N.Y.

Johns-Manville

TRANSITE Mine Service Pipe

WITH THE **RING-TITE** COUPLING

chine. Two 8-in rubber wheels and a caster permit rolling. A lock on the caster holds the machine stationary when necessary. Hose length is 15 ft.

DIAL SCALES — Cabinet dial scales being traded under the name "Floaxial" are being manufactured by Fairbanks, Morse & Co., 600 S. Michigan Ave., Chicago 5, Ill. Four features have been built into the construction of the scales: (1) a direct reading dial; (2) a full swivel head; (3) cage type central column construction; and (4) a controlled speed-pot.

Free Bulletins

COAL DUST CONTROL—Wheelabrator Corp., 1050 S. Byrkit St., Mishawaka, Ind., has published Bulletin 551-D on controlling dust derived from coal handling operations. The bulletin covers the use of local exhaust ventilation and cloth-tube-type dust collectors, a method said to be applicable to such operations as coal conveying and preparation for industrial plant burning or for power plant furnaces and boilers; for conveying, screening and weighing coke for charging foundry cupolas; and for conveying, screening, crushing, weighing and batching coal in chemical processing.

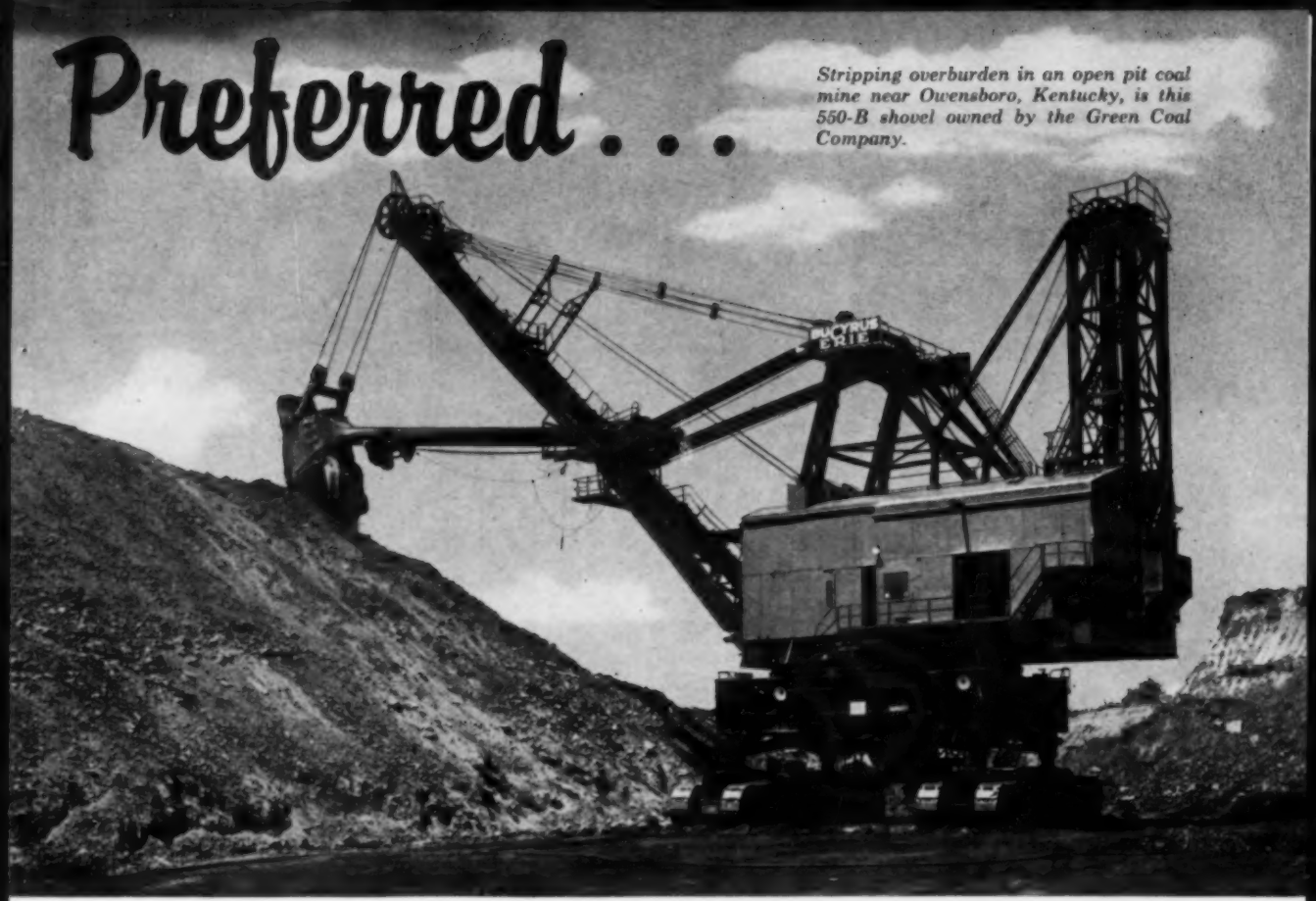
ROPE BELT CONVEYOR—Catalog G-115, published by the Goodman Mfg. Co., Halsted St. & 48th Place, Chicago 9, Ill., describes the company's rope belt conveyor. Goodman says the conveyor is a new concept in belt design, since the loaded belt is supported on chain-linked idlers suspended between two stationary parallel wire ropes. The bulletin includes what the company describes as "operating advantages."

POWER TRANSMISSION—Book 2447, published by Link-Belt Co., Dept. PR, 307 N. Michigan Ave., Chicago 1, Ill., illustrates and describes a new line of "Gearmotors" and "Motogears" manufactured by the company. The book includes selection and construction data, load classifications, dimension tables, overhung load ratings and mounting assemblies. Both designs, according to Link-Belt, are in line with new NEMA motor sizes that deliver more horsepower per pound.

RAIL SWITCH STANDS—Catalog 389, "Bethlehem Switch Stands," published by Bethlehem Steel Co., Bethlehem, Pa., describes switch stands for standard and narrow gauge rail service. Several models are illustrated.

6-WHEEL TRUCKS—An International Harvester catalog, CR-860-E, contains information about the company's 6-wheel trucks, both conventional and cab-over-engine models. Included are the S-line, R-line and CO models, powered by gasoline, diesel and liquified petroleum gas engines. The 6-wheelers, as straight trucks or as tractor-trucks, range in gross vehicle weight ratings from 22,000 to

Preferred . . .



Stripping overburden in an open pit coal mine near Owensboro, Kentucky, is this 550-B shovel owned by the Green Coal Company.

FOR ECONOMICAL, BIG-VOLUME STRIPPING

It is dependable high output that makes Bucyrus-Erie stripping shovels and draglines first choice wherever high overburden ratios threaten economical coal recovery. Their range, capacity, speed and reliability come from sound design and durable construction made possible by Bucyrus-Erie's unequalled experience in building excavating machinery of all sizes and types.

Records show that most of the major output-increasing developments in coal stripping equipment have been introduced by Bucyrus-Erie. Today the popularity of its stripping shovels and walking draglines is good indication that leadership has been maintained. Get the full details from those who know — owners and operators themselves — and find out how Bucyrus-Eries can set new production records on your stripping jobs. 70L55C

BUCYRUS ERIE

South Milwaukee
Wisconsin

75 YEARS OF SERVICE
to Men Who
Shape the Earth

There are two sides to every washery discharge clarification problem. First, of course, you need an efficient dewaterer with plenty of hydraulic and sludge handling capacity. But equally important, you need a positive filtering medium that delivers a filtrate suited to return to the washery system without build-up of fines.

This problem can be licked using either the American* Disc Type Filter (top) or the Oliver Horizontal Filter (bottom) or both, depending on the characteristics of the fines. They're both continuous vacuum dewaterers with exceptionally high capacity and solids retention values. *Each shows less than 1% solids in the filtrate.*

The information you'll want to have on these units is contained in Bulletins 218-R and 600. Just drop a line to Dorr-Oliver Inc., Stamford, Conn., and we'll be glad to send you a free copy of each.

*Trade mark Reg. U. S. Pat. Off.

DORR-OLIVER
INCORPORATED
WORLD-WIDE RESEARCH • ENGINEERING • EQUIPMENT
STAMFORD • CONNECTICUT • U.S.A.

60,000 lb, according to the bulletin. Gross combination weight ratings are from 35,000 to 65,000 lb. Motor Truck Div., International Harvester Co., 180 N. Michigan Ave., Chicago, Ill.

RUBBER HOSE, BELTING—Hamilton Rubber Mfg. Corp., Meade St., Trenton, N.J., is distributing its new, 72-p comprehensive catalog describing hose, belting, packing, molded and lathe-cut goods and mats. Information on sizes, weights, applications and construction features is included. Company letterhead.

WIRE ROPE—A handbook, "Wire Lines for Drillers," has been prepared by Jones & Laughlin Steel Corp., Wire Rope Products Div., 3 Gateway Center, Pittsburgh 30, Pa., to illustrate selection, use and care of wire rope in drilling operations. Pocketsize, the handbook contains sections covering 1) use and maintenance 2) wire ropes for rotary drillings 3) wire ropes for cable tool drilling 4) wire lines for production 5) tables of strengths.

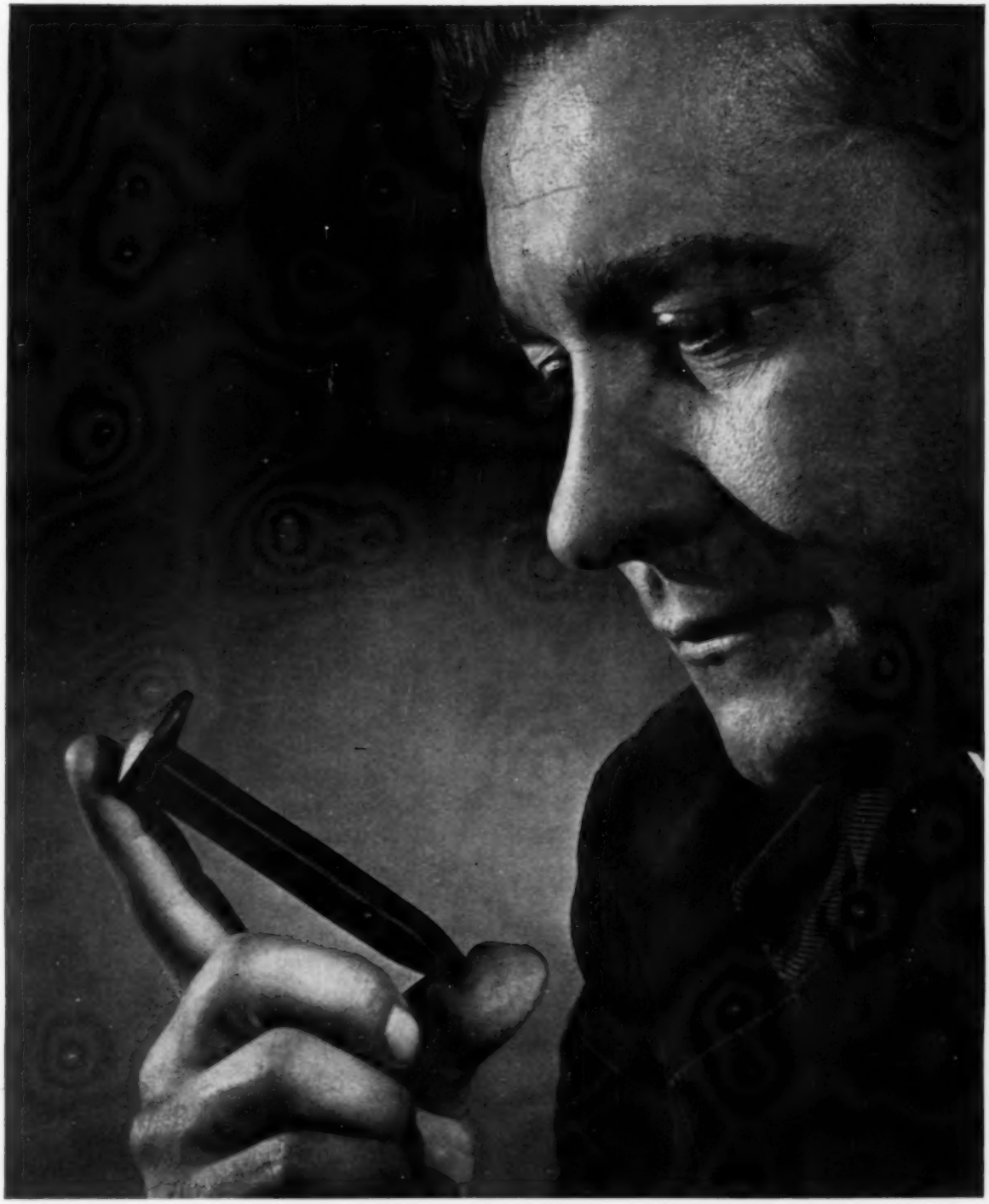
HOSE COUPLINGS, NIPPLES—Bulletin 105, being distributed by the Le-Hi Div., Hose Accessories Co., 2700 N. 17th St., Philadelphia, Pa., contains information about steel, malleable iron and brass hose couplings and nipples manufactured for industrial rubber hose in suction, water and petroleum applications.

HYDRAULICS TROUBLE-SHOOTING—A trouble-shooting chart for hydraulic systems is available from Industrial Products Dept., Sun Oil Co., 1608 Walnut St., Philadelphia 3, Pa. The chart is designed to help operators and maintenance men spot and cure common troubles. Causes and cures are listed.

SURFACE COATING—"Neoprene W," a synthetic rubber coating designed for use on surfaces in corrosive atmospheres, is described in Bulletin 701 by Carboline Co., 331 Thornton Ave., St. Louis 19, Mo. Basic characteristics, uses, applications, abrasion resistance and weathering properties are listed.

HYDRAULIC TRUCK LOADER—Lodal Inc., Norway, Mich., is distributing a bulletin illustrating operations of its hydraulic truck loader. The "multi-purpose" loader has a capacity of 3,000 lb and can load one truck or many, according to Lodal. Specifications are included.

SYNTHETIC LUBRICANTS, FLUIDS—"Ucon" synthetic fluids and lubricants (polyalkyleneglycol derivatives) are described in Booklet 6500D being distributed by the manufacturer, Carbide & Carbon Chemicals, Div., of Union Carbide & Carbon Corp., 30 E. 42 St., New York 17, N.Y. The booklet covers properties, applications and characteristics of "Ucon," which is said to be "different" than animal, vegetable and mineral oils. The company says "Ucon" fluids and lubricants have high viscosity indexes and low pour points, are wax free, non-carbonizing, sludge resistant, non-corrosive to metals and have little or no



"I've always liked Bethlehem Spikes for their strong heads and sharp points. They can take heavy pounding, and they drive fast and true."

Track bolts and machine bolts, too!

BETHLEHEM STEEL

effect on rubber. Supplied in water-soluble and water-insoluble series with or without additives.

GROUND OR RAIL CRANE—The Koehring self-propelled "Railaid," a track crane capable of working on the ground, on its own rail car and on a work train, is described in a bulletin being distributed by the Koehring Co., 3026 W. Concordia Ave., Milwaukee, Wis. The crane lifts 8.9 tons safely working from the ground, 6.9 tons from a rail car, according to the bulletin. Koehring also says the crane can propel itself at 20 mph, unload itself from its rail mount car and lift the car from the track to clear the way for normal traffic

BEARING BRONZE – "Asarcon 773" continuous-cast bearing bronze (SAE 660) is sold in the "exact length you need," according to Bulletin 301 being distributed by the manufacturer, American Smelting & Refining Co., Barber Station, Perth Amboy, N.J. The company says that there is no scrap left over when "Asarcon 773" is used. Cleanup allowances ranging from 1/32 in to 3/32 in on diameters 4 to 9 in also hold down waste, according to the bulletin.

CRANE EXCAVATOR — The newest "Bantam" crane excavator, manufactured by the Schield Bantam Co., Waverly, Ia., is described by the company in Bulletin CR-501. Specifications, operating data and capacities of the ⅜ cu yd, 6-ton, self-propelled excavator are given. These features are described and illustrated: one-man operation, two-speed independent travel; a no-shift forward-reverse travel design; and a 19½ ft outside turning radius.

STEEL CONDUITS—Heavy-wall and thin-wall steel raceways are described in a booklet published by General Electric's Conduit Products Dept. The booklet covers galvanized and black-enameled rigid steel conduit, electrical metallic tubing and plastic-coated steel conduits. Specifications and data tables on permissible conduit and EMT fill for various cable types are included. Booklet 18-255 Construction Materials Div., Bridgeport 2, Conn.

ELECTRIC CABLE—Bulletin H-463, 48 pp, covers "Keystone" heat-resistant cables, a product of the Hazard Div., The Okonite Co., Passaic, N.J. Test results are given for butyl rubber insulation under conditions of high heat and extreme moisture. Included are dimensional tables for power and control cables for direct burial and duct uses.

CRANE EXCAVATOR—Bulletin 15-B-4, describing the Bucyrus-Erie 15-B excavator-crane, is available from Bucyrus-Erie Co., S. Milwaukee, Wis. The excavator is a ½-yd shovel that can be converted to dragline, clamshell, dragshovel and lifting crane. It is sold with gasoline engine, diesel and electric motor.

HELICAL GEAR DRIVES—Book 2651, published by the Link-Belt Co., Dept. PR, 307 N. Michigan Ave., Chicago 1, Ill., contains information about in-line helical gear drives. Load classes for more than 250 applications, overhung load ratings and dimension tables for both double and triple reduction drives are listed.

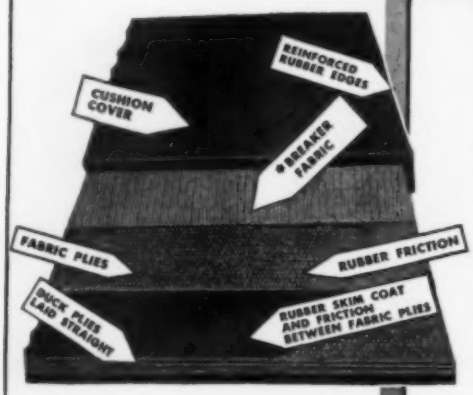
SHOVEL SHOCK CUSHION—Information describing the "Hydro-Spring," a feature of the "Drott Skid-Shovel," is contained in Bulletin CR-403-F being distributed by the International Harvester Co., Consumer Relations Dept., 180 N. Michigan Ave., Chicago 1, Ill. The "Hydro-Spring" acts as a "shock-cushion," the company says, and is offered with four "Skid-Shovel" models.

CONTROL INSTRUMENTS – Bulletin 7202, published by the Minneapolis-Honeywell Regulator Co., Industrial Div., Wayne & Windrim Ave., Philadelphia 44, Pa., describes the company's "Tel-O-Set" vertical scale indicator. Up to date information about "Tel-O-Set" recorders and controllers is also included. The instruments are used to measure and control process variables such as temperature, pressure, flow and liquid level.

STORAGE EQUIPMENT — Precision Equipment Co. has published a catalog describing steel shelving, lockers and other storage and maintenance equipment for industrial and institutional use. 3700 N. Milwaukee Ave., Chicago 41, Ill.

TOPS IN TON MILES

from every... BELT by HAMILTON



Eighty-five years of concentrated experience in serving industry . . . building belts that do the toughest jobs longer for less through improved fabrics and fibers . . . longer-lasting rubber compounds . . . up-to-the-minute construction techniques.

The result? Belting that carries more tonnage more miles per shift . . . that actually costs less over the life of the belt.

How can you know this? A trial in your own operation will furnish positive evidence. Call your nearest Hamilton Distributor.

*Breaker fabric available if required

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If you would know more about Hamilton and our complete line of Industrial Rubber Products . . . Hose . . . Belts . . . Packings and Mats write, wire or 'phone today for our all new Catalog. A copy belongs in your reference library.

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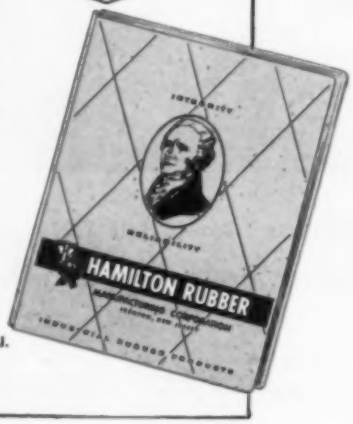

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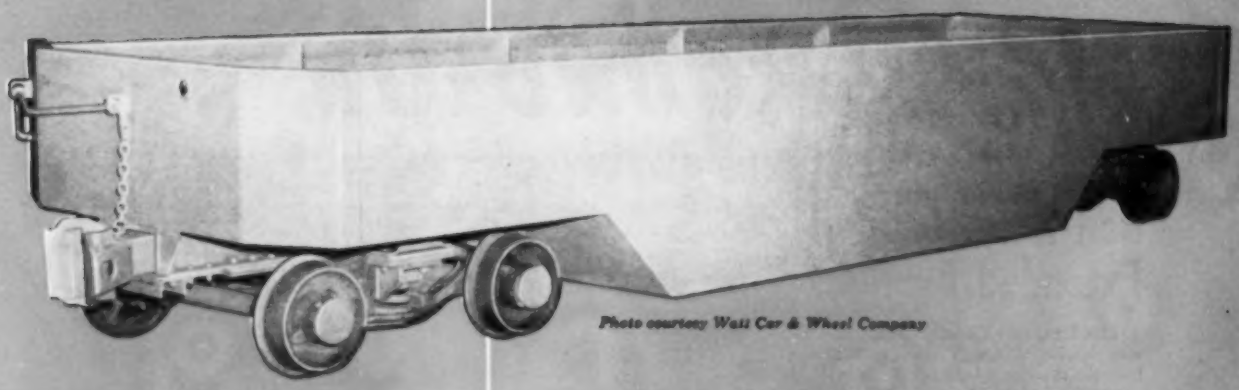


Photo courtesy Watt Car & Wheel Company

Barnes and Tucker Company continues to specify

NATIONAL

equipment for all 8-wheel mine cars

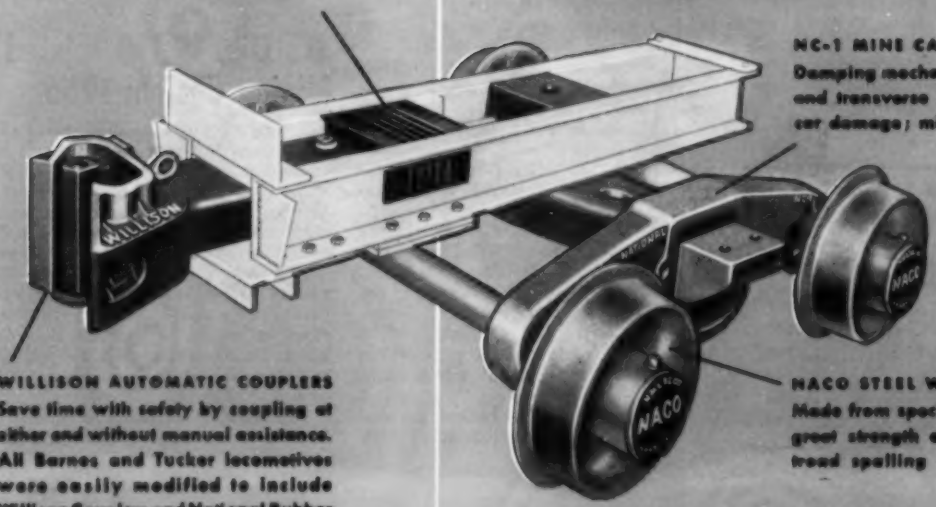
On its latest order for 100 eight-wheel Watt mine cars, Barnes and Tucker Company's Lancashire No. 15 Mine specified National equipment *throughout*. This includes National NC-1 trucks, Naco Steel Wheels, Willison Automatic Couplers, and National Rubber Cushioning devices.

This latest re-order makes—*and keeps*—the entire fleet of rotary-dump cars *100 percent National equipped*. And this means that the Barnes and Tucker Mine has one of the most modern fleets of mine cars in existence. *Modern* because the cars are safe to operate at high speeds . . . *modern* because they are efficient and minimize spillage . . . *modern* because they will continue to keep maintenance costs low.

Think of tomorrow today . . .
and modernize your cars the National way.

NATIONAL
MALLEABLE and STEEL CASTINGS COMPANY
Cleveland 4, Ohio

NATIONAL MI-236
All National Rubber Cushioning devices provide soft initial action, high absorption, and maximum protection.



NC-1 MINE CAR TRUCK
Dumping mechanism controls vertical and transverse oscillations; reduces car damage; minimizes spillage.

WILLISON AUTOMATIC COUPLERS
Save time with safety by coupling at either end without manual assistance. All Barnes and Tucker locomotives were easily modified to include Willison Couplers and National Rubber Cushioning devices.

NACO STEEL WHEELS
Made from special Naco cast steel of great strength and ductility; reduce tread spalling or flange breakage.

BA-7181

NEWS ROUND-UP

Rail Rate Hearings Extended By ICC

The Interstate Commerce Commission was having a tough time this month (March) making up its mind about a 7% across-the-board freight rate increase asked by the nation's railroads. Last month, as counsel for the railroads worked up a head of steam for their employers (argument: a $600 million a year freight increase would off-set increased labor and operating costs), coal and other big bulk shippers said they were paying rates out of proportion to other commodities. Coal men pointed out that coal rates were already 57% higher than they were in 1945. (Rates on other commodities have gone up 80% since 1945.)

The battle began Dec. 30, the date when the railroads first asked the ICC to approve the increase. Not only did they ask for a straight 7% hike, but also requested a speed-up or "quickie" procedure. This would have cut down argument time and put the rate into effect much sooner than normal procedure.

To counter the move the coal industry asked the ICC to hold separate hearings for coal. But, this was turned down by the ICC as the railroads argued with some logic that all commodities had to be considered together; if exceptions were made the increase would break down into a battle over each commodity.

Meanwhile, the ICC gave shippers until Feb. 25 (later extended to March 7) to protest the increase. Over 400 responded. Some 300 of these—headed by coal, agriculture, utility companies—strongly opposed the raise. Others supported the railroads.

The National Coal Association told the ICC that coal was already losing out to other competitive fuels; that oil, gas, diesel and motor fuels were cutting into its markets. Increased transportation costs, it charged, could only damage the industry. To this the railroads answered that transportation charges were not the only reasons for coal's loss to competitors. The handling ease of other fuels, their cleanliness and easy storage were important factors. The railroads also said that the increase would help coal production and consumption grow since the added revenue would enable the railroads to buy more freight cars to carry coal.

Verbally, coal pictured itself this way: "On June 30, 1948, the f.o.b. mine price of bituminous coal on the average for the United States was $4.99 a ton. Between that time and November 1955 wages and welfare fund payments increased a total of 78c a ton as freight rates rose aproximately 73c a ton. However, in November, 1955, the f.o.b. mine price, which had fallen below the $4.99 in the interim, was again $4.99, based on the b.l.s. price indices. In other words, in order to remain competitive the mine owners have been compelled to absorb the entire increase in labor costs in an aggregate amount slightly in excess of the increase in freight rates. Such absorption was necessary to maintain markets in the face of rising freight rates of 73c a ton as well as competition from alternative fuels."

Big utility companies backed the coal industry. Consolidated Edison of New York, for example, told the ICC that the proposed 7% freight hike would cost the company about $1.4 million a year. It said that coal freight rates are "already excessive in relation to transportation charges for other commodities."

Supporting the railroads were: The Quaker Oats Co., The American Car & Foundry Div., ACF Industries, Inc., Aluminum Co. of America.

ROYAL RANKING has been given Eileen Ryan (center), Gary, W. Va., a junior at Concord College, who will reign over Bluefield's 1956 coal show as "Queen Bituminous XIII." Her four attendants are: Fay Shumate (left), Worth, W. Va., a freshman at Concord College; Loretta Ann Hurst, Dott, W. Va., a secretary of the Crozer Coal & Land Co.; Judy Rasnick, N. Tazewell, Va., a junior at Tazewell high school and Phyllis Ann Howe, Bluefield, a senior at Beaver high school. This year's show (May 23-25) is being directed by James B. Wooldridge, Jr. H. E. Mauck is general chairman. The organizers have chosen "mechanization" as the theme.

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413 Die, 19,710 Injured Mining Coal In 1955

A total of 413 men died and 19,710 were injured last year in the nation's coal mines, according to the U. S. Bureau of Mines and the United Mine Workers of America, Safety Div. The figures were a grim reminder that digging coal is still a hazardous job. In fact, it became even more hazardous last year than in 1954 when 395 died and 19,005 were injured. Bituminous claimed 350 victims. Pennsylvania anthracite, at least 60. Roof falls killed the most men—228. No one died in underground mine fires or in major gas or dust explosions.

The sharpest criticism over the increased deaths and injuries came from

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Beat a power shovel wherever exclusive Drott *triple-power, prv-action break-out* is decisive—and where quick International crawler mobility can outspeed and "out-reach" a boom. Break-out force of the three Four-In-One models as Skid-Shovels ranges from 8,500 to 17,000 lbs!

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Get versatile carry-type scraper action with the Four-In-One in Bullclam position. Using positive clam lip control, spread materials, strip, and grade with amazing accuracy. And as a Bullclam, the Four-In-One *heap-loads* itself with speedy, earth-boiling action!

Get big dozing capacity with finger-tip ease with your Four-In-One in bulldozer position. Regulate dozing depth by hydraulic "radius control" of blade pitch. Note the frost-breaking, earth-moving action. Shown here is new 2¼-yard Four-In-One for the International TD-14.

Prove Four-In-One versatility unlimited with the 1-yard TD-6, the 1½-yard TD-9, or the new 2¼-yard TD-14 model. Test *exclusive* pry-over-shoe break-out action, and *exclusive* shock-swallowing Hydro-Spring. Ask your International Drott distributor for a Four-In-One demonstration.

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INTERNATIONAL® DROTT

Charles Ferguson, the UMWA's safety director. In an article published in the UMWA's Journal, he accused "a large segment of our industry" of failing to "assume its responsibility in saving human life."

Angrily, Mr. Ferguson lashed operators who had been paying "lip service" to safety, then he promised that they would be "called to account for their cruel negligence."

He said that a UMWA analysis "shows that 20% of the mines of our industry were responsible for more than 80% of the underground fatalities." The UMWA intends, Mr. Ferguson warned, "to see that the operators who do not cooperate shall be brought into line."

Meanwhile, the USBM, just as concerned over the heavy toll, especially the toll chalked up by roof falls, announced it was working on a shield to protect miners from falls. James Westfield, an assistant director, told a House Appropriations subcommittee on Interior Department funds that "we have a group of men working on a project of trying to develop a shield that will protect the men in the face area, where most of the workmen are killed by roof falls."

Mr. Westfield said that 80% of the fatalities attributed to roof falls occurred within 25 ft of a working face. He said the Bureau is experimenting with roof bolts and a cementing mixture to strengthen mine roofs.

Bituminous Output

YEAR TO DATE	PRODUCTION
Feb. 11, 1956	60,810,000 tons
Feb. 12, 1955	51,981,000 tons

1956 output 17.0% ahead of 1955.

A month earlier through Jan. 14, 1956, output was 15.4% above 1955.

WEEK ENDING	PRODUCTION
Feb. 11, 1956	10,190,000 tons
Feb. 12, 1955	8,690,000 tons

Anthracite Output

YEAR TO DATE	PRODUCTION
Feb. 11, 1956	3,490,000 tons
Feb. 12, 1955	3,509,000 tons

1956 output 0.5% under 1955.

A month earlier 1956 output was 3.2% over 1955.

WEEK ENDING	PRODUCTION
Feb. 11, 1956	585,000 tons
Feb. 12, 1955	654,000 tons

W. Virginia's Gulf Mining Bought By C. H. Sprague

One of the nation's biggest coal sales and exporting companies, C. H. Sprague & Son Co., Boston, Mass., and New York, N. Y., got bigger last month (Feb. 23) by purchasing the mines and properties of Gulf Mining Co., Mt. Hope, W. Va. The price Sprague paid was undisclosed. The purchase was the second of its kind by the Sprague company in four months. Last November it gained control of another West Virginia company, Gulf Smokeless Coal Co., Tams, W. Va.

To operate the new properties the Sprague company said that Winding Gulf Coals, Inc., a company that was organized last year to purchase and operate the Gulf Smokeless Coal Co. mines, would also operate the Gulf Mining Co. properties. The export and sales firm's vice president, DeWitt Snyder, disclosed that the newly-bought mines would bring the total low-volatile coal tonnage handled by Sprague alone to approximately 7 million tons a year.

ROOF BOLTING IS THE SUBJECT and Lloyd G. Fitzgerald (right) is the teacher in the accident prevention class at the Oakland Mine of the New River Co., Carlisle, Fayette County, W. Va. A total of 250 enrolled in a safety course sponsored by the U. S. Bureau of Mines. In the photo are Howard Boyce (left), Homer Stevens, Andrew Wallace, John Thomas, Andrew Thomas, Andrew Canada and Mr. Fitzgerald. U. S. Bureau of Mines mining engineer. The company reports that 92% of the men employed at the mine had completed the course by Feb. 10.

Hard-Pressed Anthracite Sees New Market In Steel

Last month a hard pressed anthracite industry looked ahead to what it hoped would be the development of a new, big market. The hopeful look ahead was based upon the results of some recent steel-making experiments in a Pittsburgh laboratory where the experimenters (the Anthracite Institute, the U. S. Bureau of Mines and U. S. Steel Corp.) managed to create satisfactory blast furnace operation after substituting anthracite for coke. At one time during the experiments as much as 60% of the total fuel charge was anthracite. But more meaningful was the fact that the anthracite had been used in its original state or "just as it came from the breakers."

For F. W. Earnest, Jr., president of the Anthracite Institute, the results were as meaningful as this: In a news release disclosing the end of the tests, Mr. Earnest said that "anthracite was the answer to the steel industry's urgent need for ever-increasing amounts of high grade blast furnace fuel."

"The crux of the steel industry's problem," Mr. Earnest said, "is that in order to increase its steel making capacity it must simultaneously make provision for obtaining additional coke supplies of some 12 million tons in the next three years." The tests indicated, he said, that steel would be able to expand without "the expense and delay of building new coke ovens, if a certain percentage of anthracite" was used in blast furnace operations. (Steel makers say that the industry will add 15 million tons to capacity in the next three years, compared to an average annual 3.5 million-ton increase over the past ten years.)

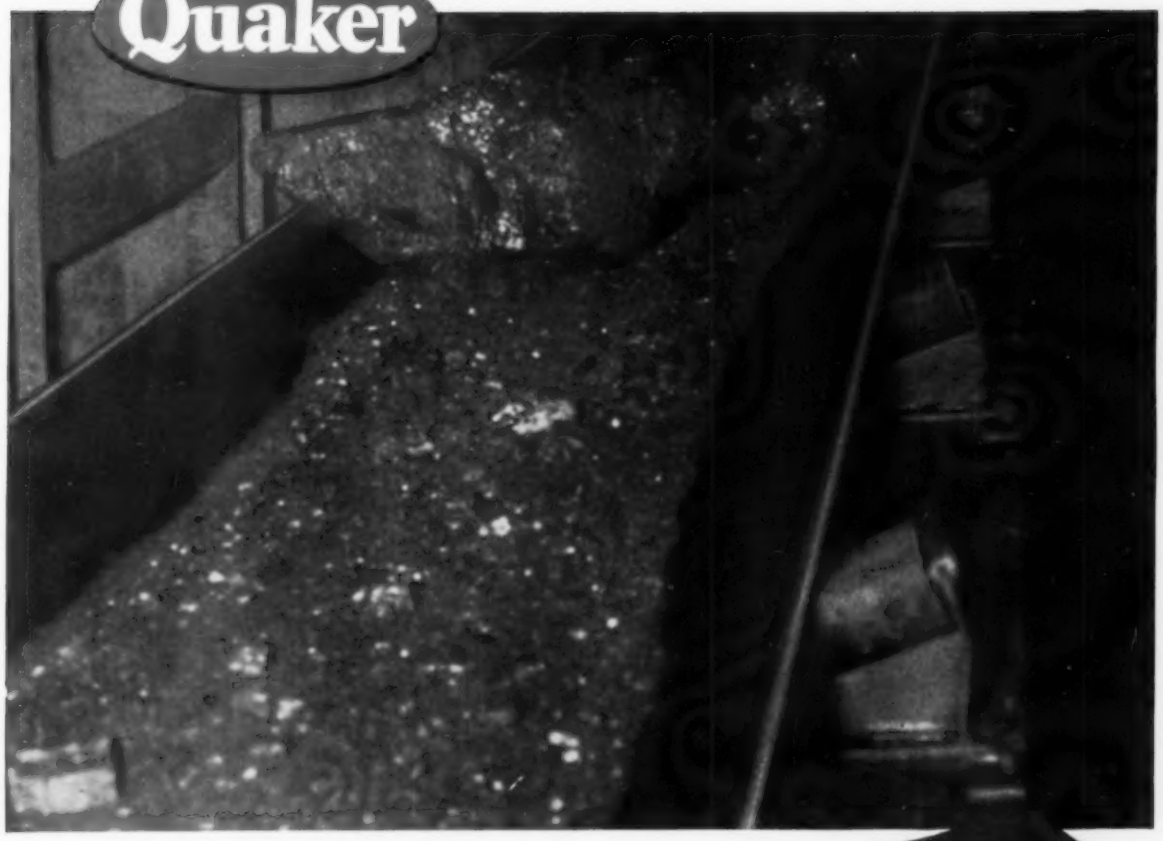
Meanwhile, the Anthracite Institute attempted to answer one major question (a practical one) that the tests failed to produce—"What percentage of anthracite may be used in full-scale blast furnace operation." To this, Mr. Earnest answered earnestly: "There is every indication that a minimum of 10% may be used."

Actually, it will be a reunion between anthracite and steel if the lab tests lead the way to a big market. Somewhat less than a century of time divides the two. Once before (1854 to 1874) anthracite was the number one metallurgical fuel in the United States. The most important iron centers, then, were situated in the Lehigh, Schuylkill, Susquehanna and Hudson valleys. As late as 1890, 173 of the nation's 551 blast furnaces were being stoked with anthracite. Last year 319,644 tons of anthracite was carbonized by coke manufacturers in the first 11 months. More than 20 million tons were mined during the same period.

Now, after years of being brushed aside by oil, gas and bituminous coal in the fuel markets, the anthracite industry's leaders are optimistically hopeful

(*Continued on p 154*)

Quaker



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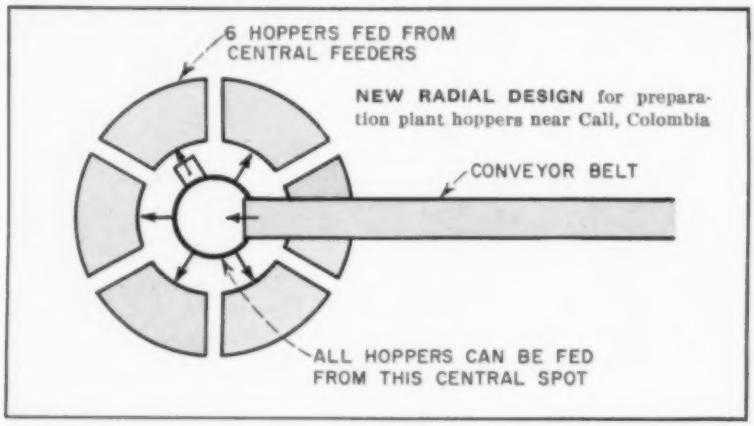
Foreign News


6 HOPPERS FED FROM CENTRAL FEEDERS
NEW RADIAL DESIGN for preparation plant hoppers near Cali, Colombia
CONVEYOR BELT
ALL HOPPERS CAN BE FED FROM THIS CENTRAL SPOT

COLOMBIA

Americans and Frenchmen have collaborated on the design and construction of a 250 tph capacity coal washing plant near Cali, Colombia, which has been built with a radically designed system of hoppers. The plant has been equipped with six circular hoppers into which coal will be fed from one conveyor belt through a central distribution point. Special distributing conveyors have been eliminated, according to McGraw-Hill's correspondent in Colombia, Waldermar Bellon, and coal transportation to storage hoppers, coal washing and coal shipping have been made completely independent operations.

Much of the plant has been designed by Americans, but the hopper design is French. Preparation Industrielle des Combustibles (PIC Fountainebleau), a French manufacturer, built the plant and Thomas Frazer, American coal mining expert, has been employed as a consultant by Colombia's semi-government institute, Instituto de Fomento Industrial.

Most coal seams in the Cali area are vertical because of geological folding in the Andes. A single shaft often cuts through three seams, producing three kinds of coal. This condition and the great number of deposits will bring to the new plant coal that contains ash varying from 5% to 30%. The area also produces three classes of bituminous: (1) less than 20% volatile substances, almost anthracite and not cokable; (2) 20% to 30% volatile material, part of which is cokable; (3) more than 35% volatile material, part of which is cokable.

Limited operations at the Cali plant are expected to begin this month. Full-time operations (125 tph) are scheduled for some time in May. The usual ash content of cleaned coal will be 6 to 8% especially for coking coal. But the plant has been designed to permit any degree of ash content. Coal can be mixed before as well as after the cleaning. Less than 6% ash content is considered uneconomical.

JAPAN

Three Japanese companies are understood to have contracted with Czechoslovakia on a triangular trade formula involving the export of Japanese ships to Czechoslovakia in exchange for anthracite from North Viet-Nam. The Japanese companies are Iino Sangyo, Furutaka Sangyo and the Hakodate Dock Co. Under the reported plan, the Japanese firms will trade two 5,000-ton freighters to Czechoslovakia for an undisclosed amount of anthracite.

WEST GERMANY

West Germany's coal mining industry is seeking a price increase. Negotiations between economics minister Dr. Ludwig Harwig and finance minister Fritz Schaeffer, and Franz Etzel, vice president of the Coal and Steel Pool High Authority, have begun. Ruhr coal mines applied for a 3 mark per ton increase (about 71c) after raising miners' wages 9%.

LIGNITE DEPOSITS extend from W. Germany into Belgium (shaded area).

More than a quarter of a million farmers who live above 60 billion tons of lignite are fated to leave their homes as the result of a struggle against one of the greatest strip mining operations in the Western world. The coal deposits are situated west and northwest of Cologne and stretch beyond Aachen and into Belgium. The coal is deposited from below top soil to more than 800 feet. In quality it is between peat and bituminous. Excavators capable of moving 800,000 cu meters of earth a day are in service in the mines. More than 200 feet high, they extract some 75 million tons a year. This figure is expected to increase to 100 million tons soon. The deposits supply the network of old and new thermo-power plants that feed the Ruhr and other industrial centers. In some areas the valuable top soil is being carefully removed at the expense of mining companies and placed in mounds for use elsewhere. Some of the huge pits evacuated by the machines will eventually be transformed into lakes.

AUSTRIA

The Soviet Union has offered to deliver large quantities of coal to Austria, according to a Viennese information source. Although Austria has been buying coal from the United States, the long sea voyage has forced the price of U. S. coal to $27 to $28 per ton in Vienna. Russia has offered her coal (a lower grade) at $22.5 and will deliver it to the Hungarian frontier. It will sell for about $24 a ton in Vienna. City authorities have placed a trial order for 1,500 tons.

Austrian coal output hit an all-time high last year when it reached 6,789,541 metric tons. The tonnage exceeded 1954 production by 328,028 tons and was double the 1938 pre-war level.

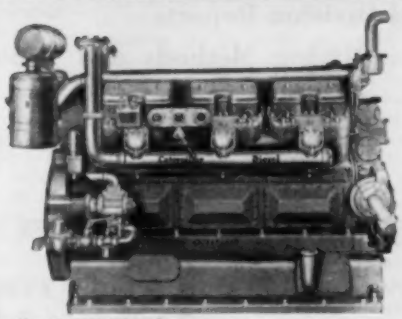
Consumption of fuel oil in West Germany is expected to continue to increase rapidly in the next few years, according to the country's oil industrialists. They predict that domestic requirements may rise to some 6 million tons in 1960. Consumption this year is expected to increase to 3,800,000 tons. Last year 2,900,000 tons were used. Fuel oil consumption, however, is only a small fraction of the total fuel picture. The quantity of fuel oil used in 1955 was about 2.2% of the West German hard coal production. But oil is seen as a valuable deterrent to importing U. S. coal. The oil industrialists estimate that about 7 million tons of coal were imported from the United States in 1955 and claim that if fuel oil had not been available, some 10 million tons would have been imported.

GREAT BRITAIN

The economic advisor of Britain's National Coal Board, Dr. G. Schumaker, said last month that the British coal industry was "consuming itself." Each year, Dr. Schumaker said, the industry loses the capacity to produce 4,000,000 tons of coal. Fifty million tons of capacity, he said, will be wasted by 1970 unless fresh money investment comes to the rescue. As far as Dr. Schumaker was concerned, Britain has given up almost complete re-

(Continued on p 160)

HOW TO GET 7000 HOURS WITH NO REPAIRS



Here is the Cat D397 Diesel

Except for half-hour stops three times a day for oiling and refueling, this shovel, powered by a CAT* D397 Engine, runs continuously, around the clock and calendar. Owned by Peerless Coals, Inc., of Mill Creek, W. Va., the big Manitowoc rig pioneers and strips overburden from a rich coal seam.

Peerless Coals, which owns three other Caterpillar Diesels, bought the D397 for its dependability and economy. How has the D397 measured up? Listen to Roy E. Klaproth, general superintendent: "It's operated more than 7000 hours without repairs. Working three 7½-hour shifts a day, seven days a week, would give any engine a workout. This powerful Cat Engine is going strong under some of the toughest conditions you'll find. The rig doesn't work behind an air drill and explosives, but gets in there and digs rock, trees and everything in its path."

Not only is the Cat D397 Engine powerful, but, like all Caterpillar Diesels, it operates cleanly and efficiently, even on low-cost fuels like No. 2 furnace oil. And it has such long-life Caterpillar features as "Hi-Electro" hardened crankshaft journals, aluminum alloy main and connecting rod bearings, and highly effective filters and seals that keep lubricants *in* and harmful grit *out*.

See your Caterpillar Dealer for full information on the D397 or other Caterpillar Engines that will do more work for *you* at lower cost. And count on him whenever you need fast, reliable service or parts you can trust.

Caterpillar Tractor Co., Peoria, Illinois, U. S. A.

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MODERN HEAVY-DUTY POWER

MINING METHODS—William L. Zeller, (left), Hurley & Zeller; W. W. Everett, Glen Alden Corp; R. L. Frantz, J. W. Woomer & Assoc; J. F. Core, Frick Dist, U. S. Steel; Ralph A. Lambert, Pennsylvania Dept. of Mines.

CONTINUOUS MINING— W. B. Jamison, (left), Pittsburgh Consolidation Coal Co; T. R. Jolley, USBM; S. Krickovic, Eastern Gas & Fuel Assoc; J. A. Younkins, Duquesne Light Co; and R. W. Stahl, USBM.

AIME—New York Meeting

Coal Division Reports

Mining Methods and Problems

Continuous Mining

Planning a Coal Preparation Plant

Materials Handling

Utilization in Carbonizing and Gasifying

MINING METHODS AND PROBLEMS, progress in continuous mining, preparation-plant planning, coal utilization and materials handling were major themes at eight technical sessions of the Coal Division, AIME, at the annual meeting at New York, February 20-23. Other features of particular interest to Coal-Division members were the presentation of the Erskine Ramsay Medal to R. Livingston Ireland, chairman of the executive committee, Pittsburgh Consolidation Coal Co., for "his vision, energy and consistent, courageous belief in and leadership of the American coal industry," and presentation of a Certificate of Honorary Membership to George M. Humphrey, Secretary of the Treasury in President Eisenhower's cabinet and formerly chairman of the Board, Pittsburgh Consolidation Coal Co.

INDUSTRY MEETING— A Special COAL AGE Staff-Written Report

Mining Methods and Problems

Industrial engineering in coal mining and water problems in anthracite mining were topics at the lead-off session on Monday morning. J. F. Core, general superintendent, Frick district mines, U. S. Steel Corp., Uniontown, Pa., and W. W. Everett, vice president, operations, Glen Alden Corp., Wilkes-Barre, Pa., were associate chairmen. The opening speaker was Ralph A. Lambert, chief mining engineer, Pennsylvania Department of Mines, who discussed the anthracite mine water problem in a paper co-authored by Daniel H. Connelly, Deputy Secretary of Mines, Pennsylvania Department of Mines. R. L. Frantz, mining engineer, J. W. Woomer & Assoc., reported on industrial engineering in coal mining and William L. Zeller, partner, Hurley and Zeller, described industrial engineering in relation to reduction of coal mining costs.

ANTHRACITE WATER PROBLEM

The strata overlying most of the anthracite coal in Pennsylvania has been subjected to much folding and, as a result, there are many breaks that permit surface water to enter the mines, particularly in wet weather, Mr. Lambert declared in discussing the water problem in anthracite mining. Nearly 5 billion tons of anthracite have been removed, mostly by mining methods which have removed all of the coal and caused further breaks in the overlying strata. Thus as more cracks were made, water was able to enter the mines more easily.

The quantity of water pumped has increased from 8 tons per ton of coal in 1920 to 14 in 1944, 27 in 1951 and 56 in 1954, Mr. Lambert emphasized in pointing out the seriousness of the water problem. The remaining reserves of 5 billion tons of anthracite are not isolated from the water and could be seriously threatened.

As a result of legislation by the federal and state governments, $17 million will soon be available for various drainage projects designed to control mine water or prevent inflow. It is estimated that inflow can be reduced from 20 to 25% with the projected program, Mr. Lambert declared.

INDUSTRIAL ENGINEERING

Rapid strides are being made in industrial engineering declared Mr. Frantz in reporting on how industrial engineering is being used in coal mining. Industrial engineering means planning for the full use of manpower and material and time studies are used as a tool to develop efficient procedures.

In mining, industrial engineering is the study and preparation of the arrangements, facilities, tools and working conditions to insure the attainment of continuous mining. The broad definition of continuous mining encompasses continuous production and service to a face operation to insure 100% use of all equipment and men and an uninterrupted flow of the product to its destination, Mr. Frantz said.

A summary of case histories shows that some companies have industrial engineering departments staffed by 14 to 16 men under the supervision of a trained industrial engineer. Other companies have set

PREPARATION—W. M. Bertholf, (left), Colorado Fuel & Iron Corp; J. B. Morrow, Alford, Morrow & Assoc; H. E. Steinman, Jones & Laughlin Steel Corp; A. P. Massmann, Sinclair Coal Co; W. C. McCulloch, Roberts & Schaefer Co; G. A. Shoemaker, Pittsburgh Consolidation Coal Co; and H. B. Charmbury, Pennsylvania State Univ.

up time and motion studies under their engineering departments. Studies show that companies using industrial engineers have an average of one such engineer for each 600,000 tons produced a year.

The coal industry has only begun to realize the potential for cost reduction held by this dynamic tool of modern management, Mr. Zeller declared, in describing industrial engineering in relation to cost cutting. Although the greatest benefits can be achieved by applying industrial engineering principles early in the life of an operation, a reduction in cost can be made at an established mine.

The first step in cost control is to set up equitable standards of performance. These show what is expected of each man and when he is to do it. They also show how many men are necessary, what equipment should be used and the best method of doing the work. Standards can be made for all combinations of equipment and conditions and can usually be summarized on a few charts covering a wide range of conditions, Mr. Zeller pointed out.

Budget and perfect cost goals are established from the work schedules based on time study. The comparisons of these goals with the actual costs form the foundation of control, Mr. Zeller concluded.

Continuous Mining

S. Krickovic, chief engineer, Eastern Gas & Fuel Associates, described performance as the most important phase in the case history of the Goodman 500-miner at the Federal No. 1 Mine, Grant Town, W. Va.

From Feb. 1 to Dec. 31, 1955, Mr. Krickovic said, 341 shifts were worked, generally on a two-shift-per-day basis, to produce 158,517 tons of clean coal, or an average of 465 tons per machine shift.

An average of 7.5 face men were employed per shift. These included a foreman, a miner operator, a loading-machine operator, two shuttle car operators, a bratticeman, a boom man, and a roof bolter (half or part time service). Although two men are used in roof bolting, the need is much less on retreat where the tonnage is much greater.

Additionally, an average of 1.5 men per shift were used on miner maintenance and 0.5 man per shift on the maintenance of other equipment. The resulting average performance during the 11-mo period was 62 tons per face man without maintenance and 49 tons with maintenance.

Indicating potentials for continuous mining, the average production per unit shift in September, October, November and December of last year were 480 tons, 505 tons, 570 tons and 642 tons, respectively. In the same order, the tons per face man were 66, 70, 79 and 88. The maximum production per shift was 798 tons, with 114 tons per man face. In at least six shifts performance exceeded 100 tons per face man.

From the record of time consumed for the many jobs done at the face, other than the actual mining of coal, the following summarizes most of the delays during the 11-mo period of operation:

		Per Cent of Time Available at Face
1. Continuous Miner		
Changing bits		6.3
Tramming		0.8
Bolting		0.3
Maintenance:		
Electrical, inc. cable	2.1	
Mechanical	6.1	
Hydraulic	2.8	11.0
Miscellaneous		0.7
TOTAL		19.1
2. Other Than Continuous Miner		
Rock dusting		3.0
Track haulage		0.6
Loading machine		1.1
Shuttle cars		1.4
Belt conveyor		0.9
Miscellaneous		1.0
TOTAL		8.0
TOTAL 1 & 2		27.1

Thus, the miner was in production, to whatever degree, 73% of the time available at the face. With 355 min as the available time per shift, the miner operated 260 min and averaged 1.79 tpm during the 11-mo period. In the last 4 mo of 1955, the figure was increased to 2.1 tpm. Since the machine has a capacity of 3 to 4 tpm in development and about 5 to 7 tpm in retreat, there is room for greater efficiency within the operating period.

During the 11-mo period of delays, the cost of bit, oil and grease maintenance material for the miner and other equipment on the section was $0.16 per ton of clean coal produced by the miner. Although the miner had produced 200,000 tons by December, 1955, no main overhaul has been scheduled yet.

Mr. Krickovic explained that the Goodman 500-miner was selected for the Federal No. 1 Mine because the machine had to be rugged. Also, the chances for success were deemed greater if its coal "winning" duty was performed by a combination of cutting and wedging, and if a full face was cut in its forward movement. "Our experience prior to 1954 with machines which ripped the coal from the face was rather average, and our observation of the boring type units in another coal mine was impressive," Mr. Krickovic said.

The 500-miner was located in a solid area in which a special projection could be readily developed. All openings surrounding the particular area were carefully investigated for the presence of sulphur balls. A representative seam section contained several pyritic bands of ¼ in to ½ in thickness, the characteristic Pittsburgh seam parting which averages 5 in to 6 in of slate, and the occasional 2 in to 3 in thick pyrite lenses. Under normal conventional mining methods, the top 10 in to 12 in and the bottom 4 in are left in place, respectively, for roof protection and to prevent contamination of the slack. Also, both segments are much higher in ash and sulphur than the remainder of the seam.

RIPPING TYPE MACHINE

Ruggedness and great flexibility feature the performance of the Joy 1-CM miner. It is giving dependable production under a wide range of natural conditions. When all face area operating supply costs, including face machinery repairs, are considered and compared, generally there is little difference between conventional and continuous mining supply costs. The 1-CM affords a substantial increase in labor productivity and thus lower overall costs.

Reviewing progress in continuous mining with the 1-CM miner, W. B. Jamison, assistant to the vice president—operations, Pittsburgh Consolidation Coal Co., noted that the Joy Mfg. Co. introduced the machine during late 1954. He said the 1-CM is designed for high coal and is, in effect, a bigger, huskier, and more powerful version of the older 4-JCM.

Mr. Jamison stated that the outstanding improvement of the 1-CM over the 4-CM is its ability to mine more coal and harder coal, and to stand up in tough jobs. With reasonable maintenance, the 1-CM machine is giving excellent and

PREPARATION—Orrin T. Barrett (left), The Daniels Co; G. H. Kennedy, Rochester & Pittsburgh Coal Co; J. L. Walker, Heyl & Patterson Co; T. M. Larimer, Clairton coke and coal chemical plant, U. S. Steel; J. M. Vonfeld, Pittsburgh Coal Co; M. R. Geer, USBM; and James Hyslop, Hanna Coal Co.

dependable performance at mines and in seams where the 4-JCM failed.

"The range of performance we have obtained varies from a monthly average of just under 450 tons of raw coal per shift to about 250 tons per shift. Monthly average tons per man shift on the section range from a little over 70 to a little over 35," Mr. Jamison reported.

The natural conditions under which the machines work are the principal cause for the variations in performance. The high figure was obtained in an area having good height but with severe bottom rolls which hurt operation of the miner somewhat and which severely affect operation of the shuttle cars. A few shifts have had operation without the handicap of rolls. The best performance has been 713 tons per shift.

In general, it has been found that discharging coal onto the bottom and loading from the pile with a high capacity loader into shuttle cars gives adequate flexible transportation. It does, however, require more manpower and may introduce more delays than the use of extensible belts under ideal conditions. In pillar mining when there is a chance of roof movement, the miner should discharge directly on the loader gathering head as any pile might prevent the miner from being moved quickly from the working place.

"Not all our machines are equipped with roof-bolting drills. We expect to equip them all soon, for we have found fewest delays with this method of roof support. The use of roof bolts, giving a clear unobstructed bottom, and a loading machine give excellent cleanup behind the miner," Mr. Jamison said.

ANALYZING DELAYS

A detailed analysis of the causes of delays of one group of four 1-CM machines in the same mine during the year 1953 revealed a number of interesting points. During the year, the total time available was almost 20,000 hr. This total time was used as follows:

	% of total time
Operating (including machine operation, normal timbering and shuttle car change)	55.0
Portal time	12.5
Lunch time	6.3
Mechanical and electrial delays on 1-CM	6.9
Other delays	19.3
	100.0

The 6.9% delay time charged to mechanical and electrical troubles upon the 1-CM machines themselves subdivided as follows:

	% of total time
Rear conveyor chains	15.1
Front conveyor chains	12.7
Total conveyor chains	27.8
Scrolls	6.7
Water system	5.5
Hydraulic system	22.4
Electrical controls	6.4
Motors	4.9
Wiring and cables	5.3
Other	21.0
	100.0

Preparation Planning

Planning a coal preparation plant was the theme at Tuesday meetings. The morning session was devoted to a discussion of the influence of market demands on coal preparation, the selection of types of cleaning units followed by discussions of the individual units. Speakers included J. B. Morrow, consulting engineer, Alford, Morrow and Assoc., Pittsburgh, Pa.; W. M. Bertholf, preparation engineer, The Colorado Fuel & Iron Corp., Denver, Colo.; A. P. Massmann, preparation engineer, Sinclair Coal Co.; H. E. Steinman, plant engineer, Jones & Laughlin Steel Corp., California, Pa.; H. B. Charmbury, head, department of mineral preparation, Pennsylvania State University, University Park, Pa., who read J. Griffen's paper; and W. C. McCulloch, coal preparation manager, Roberts & Schaefer Co., Chicago, Ill.

MARKETING AND PREPARATION

It has been said by some men in the coal industry that companies are putting too much money into preparation plants. And on seeing the new mines being developed along the Ohio perhaps they are right, J. B. Morrow observed in opening his discussion on the influence of market demands on coal preparation. A survey of power companies mining for their own use shows that most of them clean the plus ¾-in sizes and spend only enough money to decrease the Btu cost.

It is not right to compute the cost of preparation by some of the methods used since some of the items included are needed regardless of whether or not the coal is cleaned. Among these are dumping facilities, conveyors, screens and picking tables. To determine the actual cleaning cost, only the cost of the cleaning equipment should be used, Mr. Morrow emphasized. The 4x¾ usually can be cleaned at a lower cost than the gains resulting from an increase in Btu value.

On the subject of metallurgical coal, Mr. Morrow said that the steel industry is going to use less coke per ton of pig iron because of the higher grade iron ores being developed. The steel companies also are going to get more particular about coal selection.

SELECTING CLEANING UNITS

The selection of the types of cleaning units is an "occupational hazard" and sooner or later the engineer is faced with the problem of revamping an old plant or building a new one, W. M. Bertholf observed in keynoting his talk on the selection of types of cleaning units for a plant.

Coal preparation is not an exercise in pure physics since there can be no universal application of an equation. Different companies have different reasons for cleaning coal. To choose cleaning equipment properly, the engineer must study the coal and the specifications set up by the customer. The size consist of the coal must be known and washability studies made of each size. Another important factor is whether the cost of mining can be reduced to offset the increase resulting from adding washing facilities, Mr. Bertholf pointed out.

Preparation equipment may be divided into the following classes, depending on the principles of separation:

- **I Specific Gravity of Particles**
  - **A.** High density liquids
  - **B.** High density suspensions
  - **C.** "Down stroke" jigging
- **II Differential Settling**
  - **A.** Vertical currents
    - **1.** Continuous
    - **2.** Intermittent
  - **B.** Horizontal currents
    - **1.** Trough
    - **2.** Table
- **III Flotation**

Units in classes IA and B are designed for sizes above ¾-in while those in Class IC are suitable for washing X by 0 coal. Equipment in Class IIA works best if feed material is X by X÷2 in size, while

units in IIB1 can be used for feed X by 0 and those in IIB2 work best for x by 0 coal, where X is a coarse size and x is a fine size. Units in Class III are suitable for fine x by 0 coal, Mr. Bertholf said.

JIG WASHING

Jigging is the most widely used cleaning method, A. P. Massmann said, in his formal discussion of jigs. Float-sink tests should be made each shift where jigs are used for cleaning to serve as a check on machine performance.

To prevent erratic jig performance the following suggestions were made by Mr. Massmann: floats should be maintained in perfect working order; valves become worn or plugged and should be checked regularly, and adjusting orifices should not be permitted to wear out. Since the method of feeding coal to the jig affects its performance, material should be delivered regularly for the full width of the unit. If more coal is delivered to one side than to another or if the feed is segregated, the performance will be affected, Mr. Massmann declared.

Any stop in the flow of coal to a jig affects the performance of the unit. However, about 50% of the plants' stops usually can be avoided by installing storage bins and by stockpiling, Mr. Massmann said.

DENSE MEDIA CLEANING

In discussing dense-media cleaning, H. E. Steinmann confined his remarks to machines using magnetite in suspension. Types of machines in this group include inverted cones, drum separators, trough washers and shallow-bath units. All operate on about the same principles, except that shallow-bath machines use a more or less stable suspension without vertical current to sustain the medium.

Experience at the Vesta mines of Jones & Laughlin with heavy-media vessels shows that sharp variations in the percentage of sink material in the feed do not affect performance as long as the refuse removal capacity of the vessels is not exceeded. The preparation plant uses flu dust from a magnetite sintering plant as a media. The chief advantage of this material is the elimination of grinding cost and the need of recycling the material at the sintering plant. Media consumption is about ½ lb per ton of vessel feed and cost per ton has been cut in half since the flu dust has been used, Mr. Massmann remarked.

Heavy media's quick reaction to feed variations, as long as they are not in a near-gravity fraction, and to feed interruptions are among its chief advantages over equipment that requires control of a middling band to produce clean refuse.

Heavy media should be investigated under the following conditions when selecting equipment for a preparation plant:

1. When the plus 0.1 specific gravity fraction exceeds 25% at the desired separating gravity.

2. When economy dictates the need for a very sharp separation under any feed conditions.

3. When raw-coal blending or a surge bin is not feasible and an irregular feed both in quality and quantity is predicted.

4. When it is desirable to change separating gravities from time to time.

5. When a wide range in size of feed is required at one gravity. Heavy media cleans up to 14x0 coal.

6. When separating at 1.45 gravity or below.

WET TABLES AND RHEOS

Normal feed rates for wet tables for efficient separations are as follows:

⅜x0	8 to 10 net tph
¼x0	6 to 8 net tph
3/16x0	5 to 6 net tph

With Rheo units, normal feed rates per in of width of the feed launder are:

⅜x0	4 net tph
5/16x0	4 net tph
3/16x0	3 net tph
⅛x0	2½ net tph

The proper screening of the feed to both fine-coal Rheos and wet tables is important since tramp oversize causes inefficiencies and operating difficulties. Tramp oversize larger than ¾ in is liable to work into the Rheo boxes and block the discharge orifices, which may cause incomplete refuse removal and require operator attention. Oversize coal causes less trouble than oversize refuse unless there are interruptions to the feed. With wet tables oversize coal can sink sufficiently into the thin refuse bed to be carried along the deck and discharged with the refuse. The tolerance as to oversize is more critical with wet tables than with fine coal Rheos, H. B. Charmbury said.

Similar performance can be obtained from both fine-coal Rheos and wet tables. The determining factors in selecting either one will probably be found in a study of plant site, plant cost and operating costs for a given installation. The tonnage to be handled also affects the choice, since wet tables require considerable floor space that may not be available. A Rheo unit, however, requires much less floor space per ton, but because of small tonnages requires more mill head.

On the subject of operating costs, Mr. Charmbury said the labor for supervision with both types of equipment is about the same. A table plant will circulate less water, but this difference is offset by the greater power required to operate the tables. The equipment needed to recover and dewater the products is essentially the same. Maintenance of the table plant will probably be somewhat greater because of more chutes and sluices, and maintenance on table head motions, riffles, decks and feed boxes will exceed that of Rheos.

DRY TABLES

Not every coal-cleaning problem can be solved with air-washing equipment. But for coal that is easy to clean, it is readily demonstrated that air-washing has definite advantages over wet-washing processes, declared W. C. McCulloch.

From the cost standpoint of delivered Btu's, pneumatic cleaning is the most acceptable of all the preparation methods. This is based on the premise that 1% moisture is as detrimental as 1% ash.

Air washing is effective when coal is washed between 1.70 and 1.90 specific gravity. Certain coals in specific market areas may require low-gravity washing to meet a competitive market. But unless other factors of low-cost mining or overhead are present to offset the greater cost, the operation will not be profitable, Mr. McCulloch declared.

Air-washing will not clean wet coal in sizes below ⅜ in. Appearance of the coal is not improved if it is discolored. Flats, particularly in the heavy bone fractions, will report with the coal. Air-washing is essentially a black and white separation and will not make a precise cut on a difficult coal to clean. Presizing is needed to produce a narrow size range in the feed and dust is a problem, observed Mr. McCulloch.

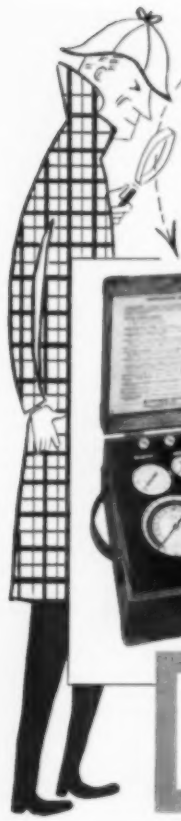
Offsetting these disadvantages are numerous advantages. Air-washed coal will not freeze in transit in winter and it sheds rain in transit. It flows freely, both in unloading and in handling through a boiler plant. The Btu value is highest for any given coal; this is true in the fine sizes where heavy-media separation is not applicable. Air-washed coal is more amenable to oil treatment and it eliminates the problem of stream pollution. The cost of operating a typical plant, excluding capital costs and amortization, is about $0.048 per ton, Mr. McCulloch concluded.

Continuing the theme of planning a coal preparation plant, speakers at the Tuesday afternoon session were G. H. Kennedy, preparation engineer, Rochester and Pittsburgh Coal Co., Indiana, Pa.; J. L. Walker, Jr., mining engineer, Heyl & Patterson Co., Pittsburgh, Pa.; Orrin T. Barrett, director, coal preparation, The Daniels Co., Contractors, Inc., Indiana, Pa.; W. L. McMorris, general manager, coal preparation and distribution, U. S. Steel Corp., Pittsburgh, Pa.; H. F. Yancey, supervising engineer, USBM, Seattle, Wash., who read E. R. McMillan's paper; J. M. Vonfeld, product control manager, Pittsburgh Coal Co., Library, Pa., and T. M. Larimer, division engineer, Clairton coke and coal chemical plant, U. S. Steel Corp., Clairton, Pa. James Hyslop, president, Hanna Coal Co., St. Clairsville, Ohio, and M. R. Geer, mining engineer, USBM, Seattle, Wash., were associate chairmen.

SELECTING DEWATERING AND DRYING UNITS

A number of things are important in the selection of a dewatering or drying unit, said G. H. Kennedy, in the lead-off talk at the Tuesday afternoon session. Among these are: producing a product with surface moisture of about 3%; friability of the coal, because of degradation in the drying process and possible ensuing loss of revenue; physical characteristics of the coal; and a freely flowing product. Mr. Kennedy then described the various units available for mechanical dewatering and thermal drying. In thermal drying there is a definite need for a better system of controlling moisture than is available today. Fine dry coal is dangerous and special attention should be given to the way it is handled.

Speaking on the selection of a fine-coal centrifuge, Mr. J. L. Walker said that a centrifugal unit will remove more water per dollar invested than any other unit



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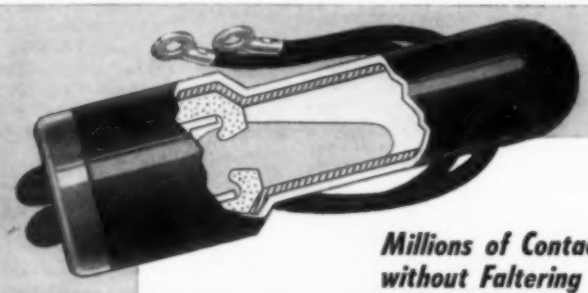

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available. There are three principal types of such units: (1) vertical-basket type with transfer device, such as the CMI and Reinevelt machines; (2) vertical-basket types without conveyor, now available in the Bird Humboldt unit; and (3) the continuous-horizontal type machines as represented by the Bird horizontal filter.

Since a centrifuge is a hard working machine, it therefore requires more maintenance per ton of dried coal than any other. But maintenance is not the largest cost in drying coal. Power is the largest item in cost of operating centrifugal dryers. To make a proper comparison of the three machines, it is necessary to compare them as individual units and as circuits, Mr. Walker said.

DEWATERING SCREENS

In most dewatering installations there is a definite place for vibrating screens. The initial, operating and maintenance costs are low, and when used within their limitations, rather large quantities of solids can be removed from the dirty water system with a minimum of effort, Orrin T. Barrett declared in discussing dewatering screens.

Drives may be either of the unbalanced-shaft or electrically actuated types. Usually, it is desirable to have a fairly high frequency and stroke. The direction of the stroke should be at an acute angle with the screen deck so the dewatered material can be carried off the end of the screen. Screen decking usually should be of the bar type with continuous openings for the full length of the screen. Care should be taken to keep the width of the screen narrow enough so a bed can be maintained at all times. Sometimes it is wise to place a dam, only high enough to prevent flooding, near the center of the screen. A dam at the discharge end will help dewater the solids; but care must be taken not to make the dams too high and thereby create a thick bed, Mr. Barrett said.

CENTRIFUGES

The dewatering results with any of the three types of centrifuges are probably more affected by the retention of extremely fine sizes smaller than 325 M than by any other factor, W. L. McMorris said in commenting on centrifugal dryers. The quantity of material recovered is more important than the selection of equipment because extreme fines frequently raise the ash and moisture in the final product. Maintenance cost can be kept to a minimum if work is frequent.

THERMAL DRYERS

H. F. Yancey, session chairman, read E. R. McMillan's discussion on thermal dryers. A drying unit in use at the Northwest Improvement Co. was reported to have a high efficiency because it combines heat and mechanical drying. Early erosion and corrosion problems were solved by application of special materials. The cost per ton, based on 250 operating days, is 19.6c and dust control is excellent.

WATER CLARIFICATION

An adequate water clarification should meet the following requirements: (1) it

(*Continued on p 131*)

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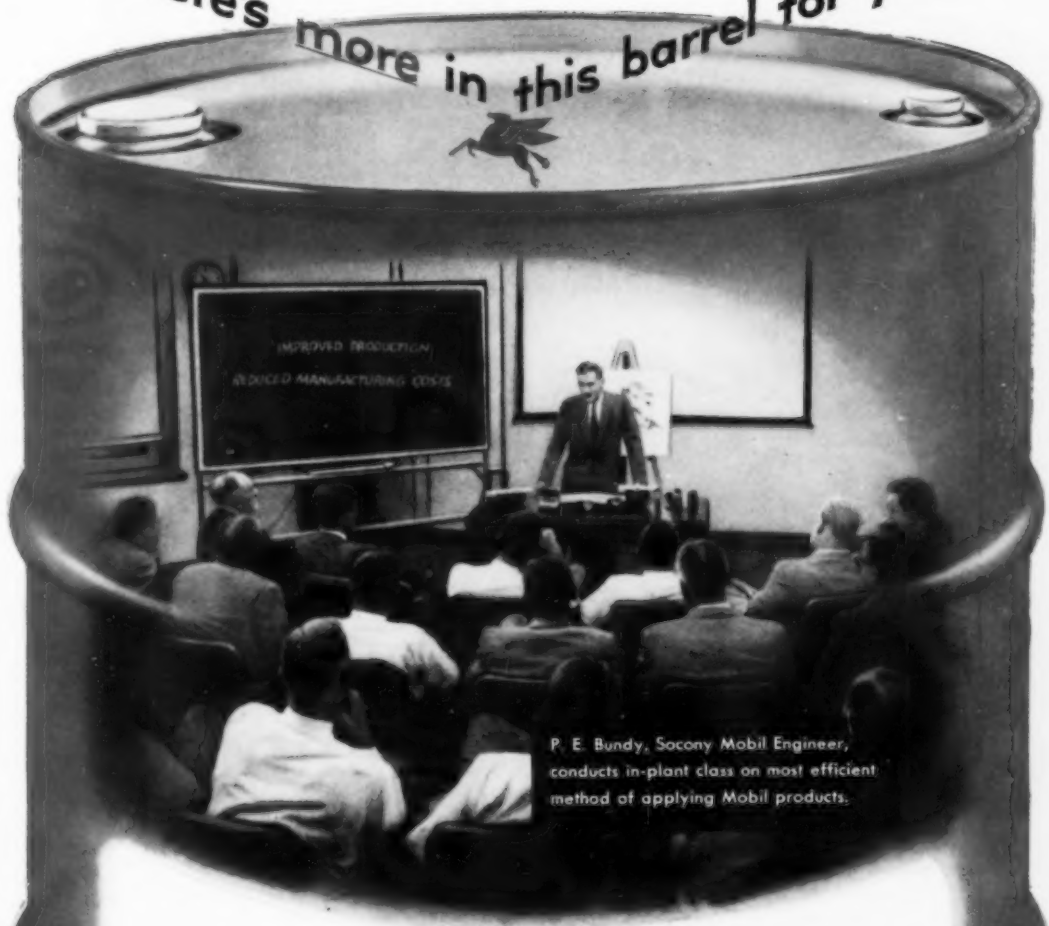

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AIME (from p 128)

must be able to control the solids in the circulating water (the tolerance of solids in circulating water depends on the type of cleaning unit, the specific-gravity of separation and specific-gravity distribution); (2) it should recover the maximum quantity of merchantable coal; (3) it should recover as much water as possible for reuse; and (4) it must satisfy the requirements of anti-pollution laws, J. M. Vonfeld said.

To satisfy the design needs of a system, the engineer must consider the following: classification, cleaning, filtering, flocculation and sedimentation. Each plant has its own peculiarities and the selection of equipment for water clarification requires an exhaustive study, Mr. Vonfeld declared.

INFLUENCE OF CIRCULATING WATER

For successful operation of a wet plant, solids in the circulating water must be removed from the water system as produced. This can be done in several ways after concentrating the solids into a heavy slurry: (1) pumping to waste; (2) filtering and delivering to waste; and (3) filtering and delivering to clean product, T. M. Larimer remarked.

Operating experience at the Clairton plant of U. S. Steel shows that 5 to 8% solids in the water result in optimum plant performance. A higher concentration reduces plant efficiency and higher ash. A concentration in the range of 1 to 4% can also contribute to unfavorable performance, Mr. Larimer added.

MATERIALS HANDLING

Materials handling was the theme of a Wednesday morning symposium with R. U. Jackson, manager of mining sales, Hewitt-Robins, Inc., Passaic, N. J., and H. C. Nyquist, vice president, Joy Mfg. Co., Pittsburgh, serving as associate chairmen. Speakers and their subjects were A. R. Anderson, general manager—mining div., Jeffrey Mfg. Co., Columbus, Ohio, on handling materials inside the mine; E. H. Citron, preparation engineer, Pittsburg & Midway Coal Mining Co., Pittsburg, Kan., on handling coal from the portal to rail or river loading; and J. T. Crawford, vice president, Northwestern Hanna Fuel Co., Duluth, Minn., on shipping coal from the mine to the consumer. Following the symposium, a report of research on conveyor idlers was presented by Felix du Breuil, assistant professor of mining, Pennsylvania State University, University Park, Pa., and George Radomsky, mining engineer, Intermountain Chemical Co., Westvaco, Wyo.

UNDERGROUND TRANSPORT

In tracing the history of underground transportation developments, Mr. Anderson described equipment for hauling coal away from the face, moving supplies toward the face and transporting men to and from their working places. In all instances, transportation equipment has been designed primarily to increase the actual productive operating time of load-

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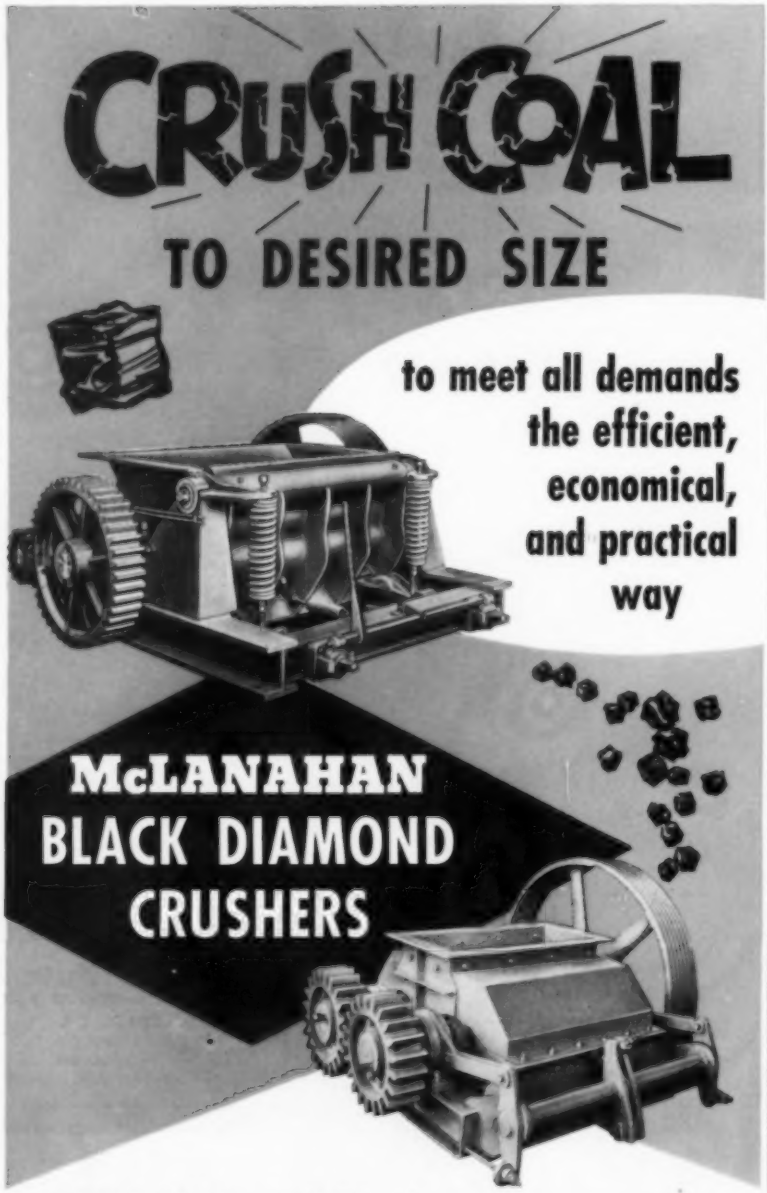

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ing machines as these were developed. Noteworthy steps in this process include the use of larger mine cars to reduce car-change time, introduction of shuttle cars to eliminate tracklaying and track recovery in the face area, and the development of full conveyor systems or combined conveyor and mine-car haulage.

Supply handling complicates the picture somewhat, Mr. Anderson noted, in mines using conveyors from the face to the portal. Definite scheduling of supply haulage is the answer, including the employment of a third-shift supply crew if necessary. In some cases, an auxiliary transportation system for supply handling may be a worthwhile investment.

SURFACE TRANSPORTATION

Materials-handling equipment for surface installation should be selected only after careful consideration of tonnage requirements, distance, character of the terrain, life of the mine and the size of coal or other material to be transported, Mr. Citron said. Truck haulage is an economical means of handling relatively low tonnage over short distances, but requirements for higher-capacity haulage may lead to the selection of a belt conveyor. Good conveyor maintenance can result in low-cost transportation by materially increasing the useful life of the belt and the conveyor assembly.

Where the cleaning plant is some distance from the portal, it may be advantageous to provide a rotary breaker at the portal to remove all large refuse, thus reducing the load on the mine-to-plant conveyor, Mr. Citron pointed out. There are benefits also in providing stockpiles of raw coal and washed coal at the plant to make the mine and plant independent of each other. A stock of coal sufficient for three shifts of plant operation and final loading on rail or river provides a reasonable cushion against unexpected interruptions.

Turning to the design of such stockpiles, Mr. Citron pointed out that a sidehill location is best if terrain permits, and that the pile should be on the surface to get full realization of all possible drainage benefits. A storage pit, on the other hand, collects rain and snow and cannot be easily worked to eliminate heating in the pile.

LONG-DISTANCE TRANSPORT

Pipeline transmission of coal is past the experimental stage and belt-conveyor use for shipping coal longer distances is receiving more attention, Mr. Crawford said, in presenting on slides a survey of equipment for loading and unloading lake freighters.

Most noteworthy among the newer methods is the 103-mi coal pipeline from Cadiz, Ohio, to Cleveland. The 10-in line will handle 150 tph of a fine-coal slurry containing 50% solids by weight. Pressure in the line will be about 950 psi and the stream will move at a rate of about 3½ mph. Pumping stations will be 35 mi apart. Other pipeline ventures include a 5½-mi line handling 1,000,000 tons of material a year at Carling, France, and a line at Copper Cliff, Ontario, transporting 4,000,000 tons a year over a distance of 7½ mi. (*Continued on p 134*)

Auger mines 700 tons of coal per shift

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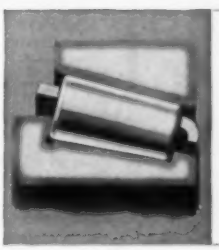


GREATER LOAD AREA

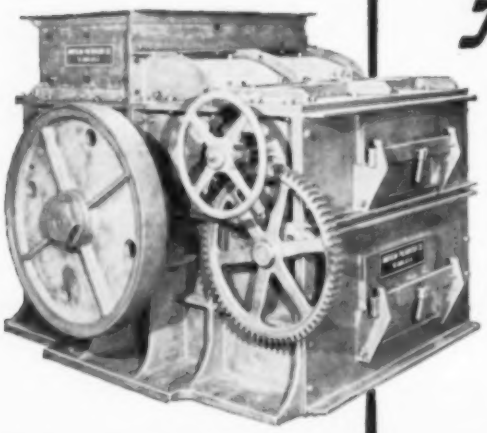
Because the load is carried on the *line* of contact between rollers and races, Timken bearings carry greater loads, hold shafts in line, wear longer.

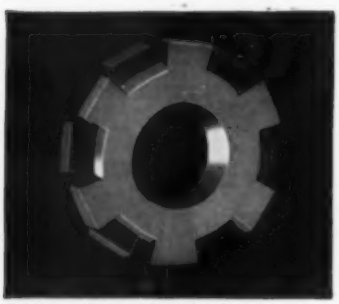
Only Timken tapered roller bearings have these advantages: 1. advanced design; 2. precision manufacture; 3. rigid quality control; 4. Timken fine alloy steels.

NOT JUST A BALL — NOT JUST A ROLLER — THE TIMKEN TAPERED ROLLER BEARING TAKES RADIAL AND THRUST — LOADS OR ANY COMBINATION

BETTER COAL CRUSHING CONTROL BECAUSE IT'S BUILT BETTER . . .

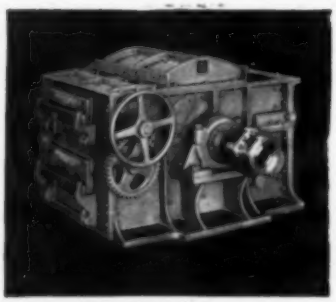
American ROLLING RING COAL CRUSHERS





1 Patented Shredder Ring

American-originated feature that splits coal instead of smashing it—for uniform sizing, minimum fines. Result: Americans run at slow speeds, with savings in power and maintenance. No cams, shear pins, toggles.



2 Heavy-Ribbed Steel Frame

Bearing pedestals are cast integrally with lower side frames. Sectional design for easy dismantling . . . abutting joints accurately machined and bolted together for dust-tight fit.

3 Completely Lined Crushing Chamber

Heavy, renewable liners . . . sectional for easy plate-at-a-time replacement . . . engineered to offer life-time protection to the frame.

4 Complete Accessibility to Adjustment and Parts

All adjustments external—even with crusher in motion. Rotor easily reached by removing top section. Rings readily reversed or replaced. Liners quickly reached, too, for periodical inspection.

WRITE for Coal Crushing Bulletin

American PULVERIZER COMPANY

Originators and Manufacturers of Ring Crushers and Pulverizers

1119 MACKLIND AVE. • ST. LOUIS 10, MO.

AIME (from p 132)

Belt-conveyor use continues to grow in popularity each year in applications for almost any distance, Mr. Crawford said. More and more instances are noted of the use of belt conveyors from mines or preparation plants direct to consuming facilities nearby, such as that of the Ohio Public Service Co., and that from the Mathies cleaning plant to the Mitchell station of Duquesne Light Co.

CONVEYOR RESISTANCE

In reporting results of a 2-yr Penn State research program, sponsored by Hewitt-Robins, Inc., on the conveying and running resistance in belt conveyors, Dr. du Breuil and Mr. Radomsky pointed out that the matter becomes of greater importance as belt designers and users look forward to extremely long conveyor runs. Conveying resistance is defined as an increment of belt tension, in pounds, over a specified length of belt and is a measure of belt elongation in that distance. Running resistance is included in total conveying resistance and is caused by friction inside the idler rolls by bearings, grease and seals. The Penn State researchers designed laboratory test stands to measure these forces in belt and idlers and suggested that with some changes these test stands could be used in the field.

Coal Carbonization

Coal carbonization was the general theme of the Wednesday afternoon session with these speakers: F. W. Smith, assistant technical director, American Brake Shoe Co., formerly of the Bureau of Mines, speaking on the subject of producing better coke by thermal pretreatment of coal; M. O. Holowaty, chief, raw-materials research, Inland Steel Co., on structural changes in heated coals, and R. J. Grace, project engineer, Bituminous Coal Research, Inc., on sulfur-rejection studies in coke utilization. A. H. Brisse, research associate, U. S. Steel Corp., presided.

PREHEATING COKING COAL

After describing methods and equipment employed in the preheating studies, Mr. Smith reported conclusions as follows:

1. Preheating Illinois No. 6 coal in the temperature range of 200-350 C and carbonizing without intervening cooling increased coke strength (1-in tumbler index) markedly, did not benefit physical properties of coke made from blends of No. 6 and Pocahontas No. 3, and caused variations in the dry-coal bulk density.

2. Preheating benefited the coke-making property of low-oxygen Pittsburgh-seam coal moderately, indicating that factors other than oxygen removal or increase are important in the process.

3. Maximum benefits of preheating are obtained when the preheated coal is charged to the carbonizing furnace without cooling, and favorable results were obtained in using steam, nitrogen or the gases resulting from preheating as the treatment atmosphere, although an oxygen concentration of 0.42% in the preheating gas greatly reduced the ef-

(Continued on p 144)

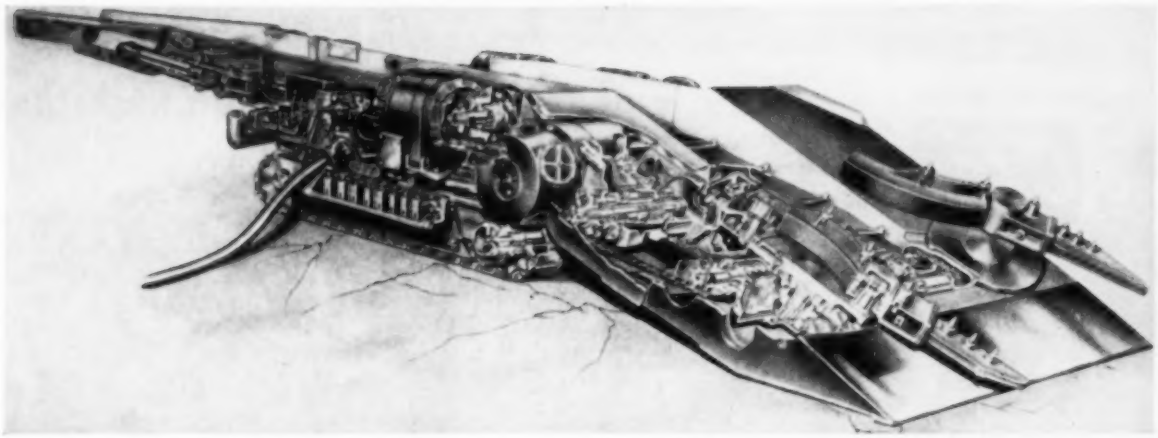


PHOTO COURTESY JOY MFG. CO.

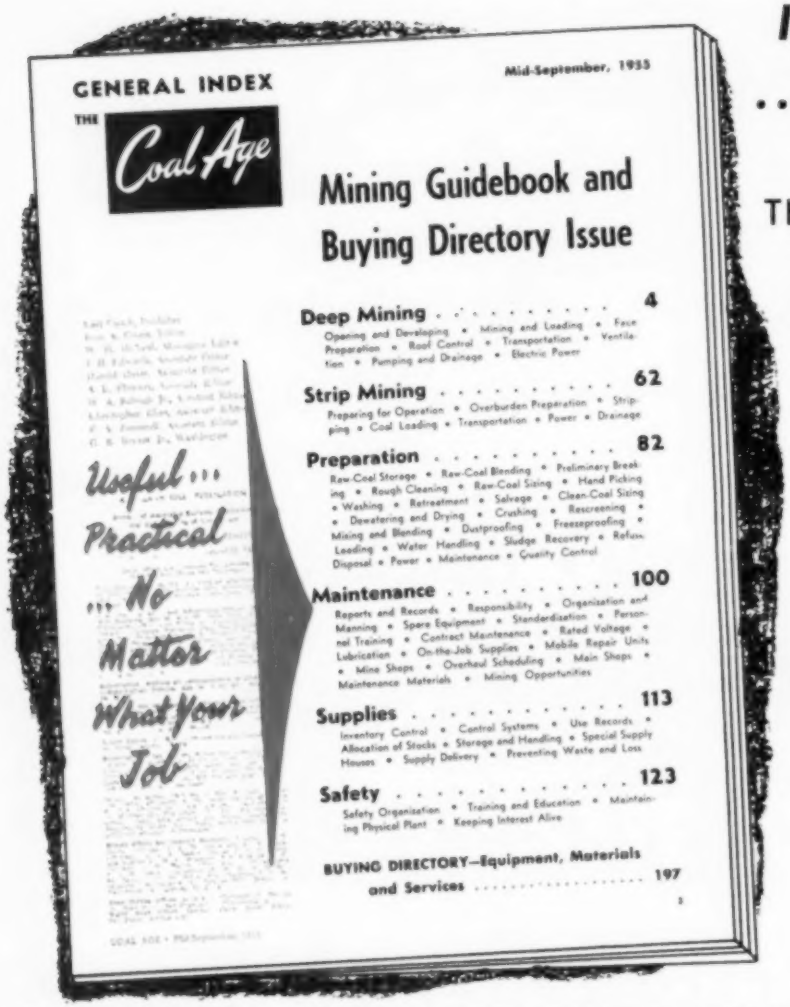
Amoco mine lubrication provides safe, sure gear protection!

Unusual extreme pressure characteristics and extra oiliness qualities, plus ease of handling at low temperatures, make Amoco Leaded Lubricants a favorite in many mine operations. Recommended for universal joints and gear cases of loading machines, shuttle car wheel units, worm gear speed reducers, heads and gear cases of mining machines, open gears, and many other applications. Another great product by Amoco!

AMOCO LUBRICANTS

...SURE • SAFE *FOR MINE MACHINERY*

AMERICAN OIL COMPANY AMOCO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Mid-September, 1955
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Useful ... Practical ... No Matter What Your Job

IF YOU ARE SEEKING ...Want to Check the

THE *Coal Age* *Can Help*

HOW SOME COAL AGE SUBSCRIBERS ARE USING THE GUIDEBOOK

"We find it most useful as a ready and valuable reference in working out some of our own problems . . . as a guide in purchasing new equipment and parts." — *General Superintendent, Pennsylvania Bituminous.*

"One article concerning power set-up for trackless mining enabled us to revamp our set-up, making it safer in case of fire. We passed this article around so that our men would know what to do in case of cable fire." — *Mining Engineer, Illinois.*

"The Guidebook contains so many hints and ideas . . . No coal man who looks ahead should be without it." — *Manager, Pennsylvania Bituminous.*

"I had a section where the coal wasn't breaking down sufficiently for loading. After checking diagrams on page 28, found that we can shoot the coal more efficiently. I think the Guidebook is a valuable book . . . We, as coal men, need an open mind and an up-to-date Guidebook to cope with modern methods of mining."—*General Foreman, Kentucky.*

"Your sections on continuous mining and conveying methods have been of much interest. Offers a splendid reference guide. One need only keep this on file from year to year to have a fingertip backlog of information on hand for ready use." — *Industrial Engineer, West Virginia.*

"Used Guidebook looking for information to improve safety record of our mines . . . I like the principle and general outline of the Guidebook . . . I think it is good to have a number of good practical idea applications compiled under the various headings for easy reference." — *Preparation Superintendent, Kentucky*

"Find it to be very constructive and interesting. Am wondering if it would be possible to secure thirty (30) copies of the section dealing with "The Strip-Mining Guidebook" . . . please feel free to bill us." — *Executive Vice President, Missouri.*

"Have used Guidebook for discussing digging with dragline operators." — *Assistant to Vice President, West Virginia.*

"Good reference to compare our problems with ideas of others. Also to find names and addresses of suppliers of mining equipment and supplies."—*Superintendent, Operations, Illinois.*

NEW IDEAS . . . Need a Fresh Slant on Operating Problems
Latest Mining Methods and Equipment

1955 Mining Guidebook

And Buying Directory Issue

You Widen Your Job Outlook

The first issue of a new annual service for all subscribers, the Mid-September 1955 COAL AGE "GUIDEBOOK" is the largest, most complete *single* source of information on current mining practice available anywhere.

The new COAL AGE Mining Guidebook and Buying Directory Issue was inaugurated to serve you as a practical on-the-job reference manual on all phases of modern mine operation. You'll find it a helpful timesaver, whether you have a definite problem, are seeking to improve your methods or are planning a new installation.

Ideas are the backbone of mining progress. New techniques, changes in methods, improved equipment are important. Used consistently, the COAL AGE Guidebook can help you keep up on what's going on. It's a good starting point for developing new ideas . . . a sure way to broaden your personal horizon.

The 1955 Guidebook – complete in one volume – outlines the basic mining principles you have to deal with . . . summarizes current operating practice and results at hundreds of efficient, low-cost mining properties. The 42-page Buying Directory, together with manufacturers' advertising, will help you locate equipment, materials and services geared to your particular needs.

The 172-page Guidebook section – about 2½ times the size of the usual COAL AGE issue–is the largest single editorial section ever published in any coal mining publication. It's the only up-to-date, complete guide to mine operation published today. In fact, COAL AGE Editors developed the idea for this additional issue just because hundreds of mine officials told us they needed and wanted such a practical reference manual. Its potential usefulness to you is indicated by subscribers' typical comments quoted here.

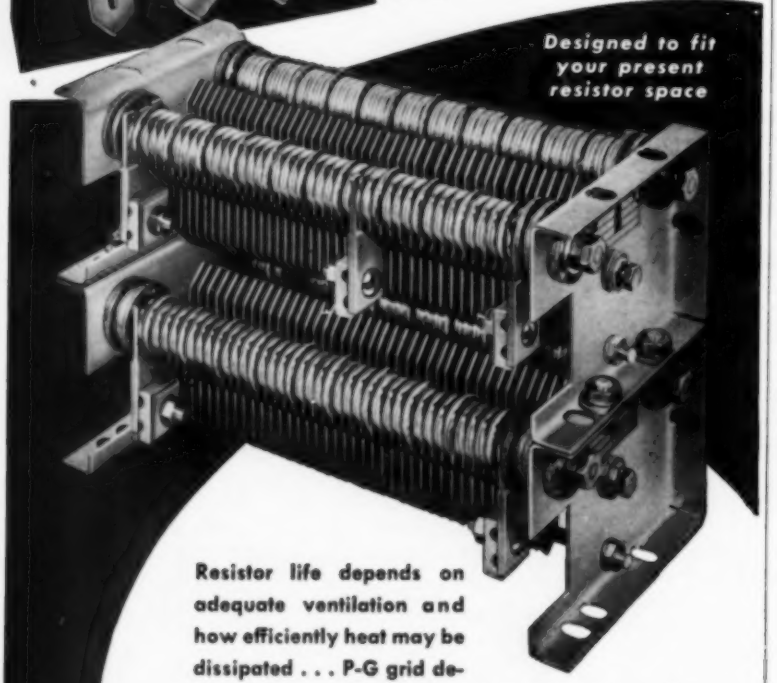
COAL AGE's Mining Guidebook and Buying Directory Issue is an established annual service provided subscribers at no additional cost. The 1956 edition, completely revised and up-dated, will be published in Mid-July, 1956.

USEFUL . . . PRACTICAL . . .

. . . NO MATTER WHAT YOUR JOB

Resistor life depends on adequate ventilation...

Patented P-G Grid Design assures maximum ventilation



Designed to fit your present resistor space

Resistor life depends on adequate ventilation and how efficiently heat may be dissipated . . . P-G grid design equalizes the amount of air space surrounding each leg or loop to obtain even heat throughout the grid area. (Note illustration.) . . . Since heat is rapidly and evenly dissipated, hot spots fail to develop and longer resistor life is assured . . . For a nonbreakable resistor (only steel and mica used) specify P-G on your next application.

P-G

The Nonbreakable Steel Grid Resistor

THE POST-GLOVER ELECTRIC COMPANY

ESTABLISHED 1890

221 WEST THIRD STREET, CINCINNATI 2, OHIO

Preparation Facilities

Dial Coal Co., Blanchland, W. Va.—Contract closed with the Deister Concentrator Co. for one SuperDuty Diagonal Deck Coal Washing Table for cleaning river coal.

Jewell Ridge Coal Corp., Tazewell, Va.—Contract closed with the Eimco Corp., Pittsburgh, Pa., for filters to handle powdered coal in Jewell Ridge Coal's West Virginia fine coal plant. Operation to begin in May.

Melayne Pocahontas Coal Co., Arista, W. Va.—Contract closed with The Eimco Corp. for filters to handle powdered coal. Operation to begin in May.

Compass Coal Co., Dola, W. Va.—Contract closed with Industrial Engineering & Construction Co. for a preparation plant at Compass No. 3. Conveyor equipment to handle 500 tph R-O-M. Storage bin to preparation plant capacity 350 tph of 5x0. The 5x¼ will be cleaned in a Chance Cone, the ¼x0 will be cleaned on Deister No. 7 SuperDuty tables. The ¼x0 will be centrifugally and thermally dried. Water clarification system includes cyclone thickeners, Dorr Thickener and vacuum filters. Completion date: last six months of 1956.

EQUIPMENT APPROVALS

Eight approvals of permissible equipment were issued by the U. S. Bureau of Mines in January, as follows:

Acme Machinery Co.—Type 275 SPRHJB air compressor; one motor, 75 hp, 230 v, DC. Approval 2-1116; Jan. 16.

J. H. Fletcher & Co.—Model DKHT roof drill; one motor, 20 hp, 230 v, DC. Approval 2-1117; Jan. 16.

Joy Mfg. Co.—Types 6SC7BPXF-2 and 6SC7BPF-2 cable reel shuttle cars (modified by SBM8707); three motors, 10 hp, 500 v, DC. Approval 2-1118A; Jan. 17.

Joy Mfg. Co.—Type T2C5APE/FI mining machine truck; two motors, 4 hp, 250/500 v, DC. Approvals 2-1119 and 2-1119A; Jan. 20.

Joy Mfg. Co.—Type XB30R-2F 30-in extensible belt conveyor; three motors, one 25 hp and two 15 hp, 500 v, DC. Approval 2-1087A; Jan. 23. (Approval 2-1087 covering the 230 v conveyor was issued Sept. 23.)

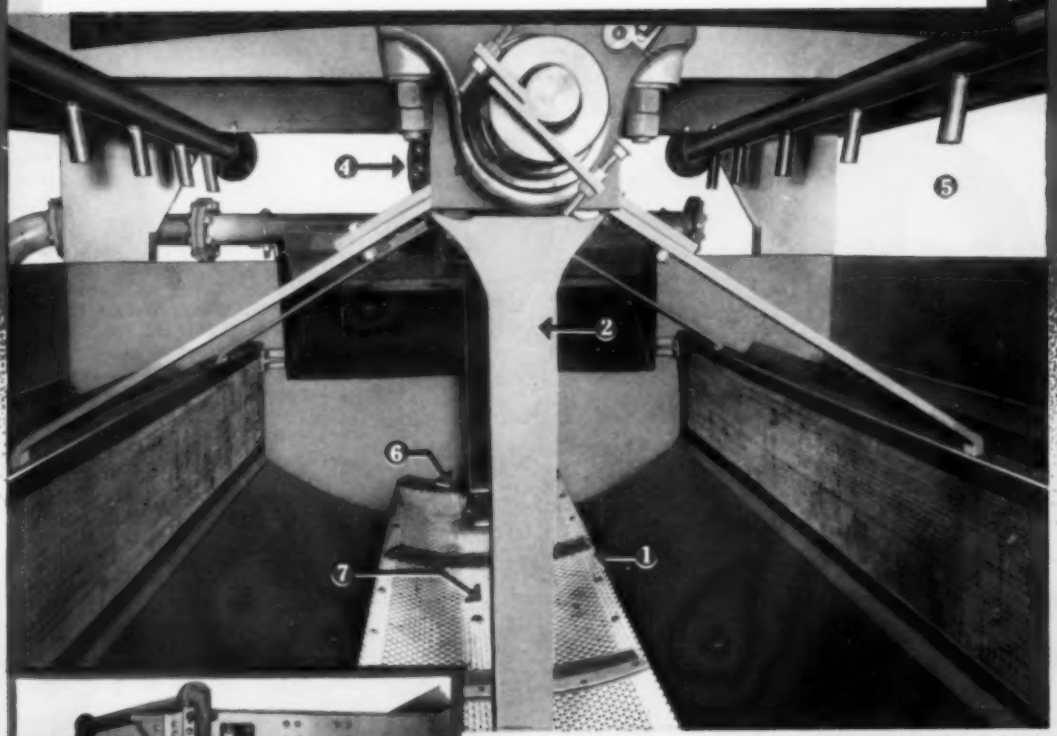
Joy Mfg. Co.—Types 10SC13BPE/BPX-2 and 10SC14BPE/BPXE-2 cable reel shuttle cars; five motors, three 15 hp and two 30 hp, 250 v, DC. Approval 2-1120, Jan. 26.

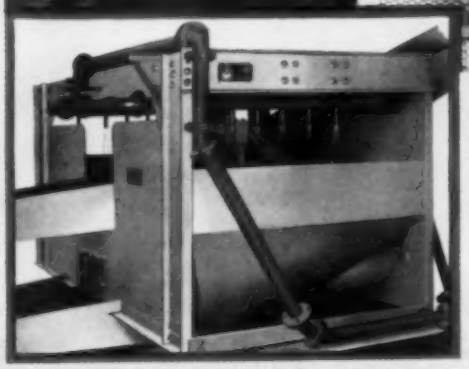
Acme Machinery Co.—utility truck; one motor, 20 hp, 230 v, DC. Approval 2-1121; Jan. 26.

Joy Mfg. Co.—Type X-855-12 24-in bridge conveyor; two motors, 3 hp, 250 v, DC. Approval 2-1122; Jan. 31.

Here's Design Simplicity You Can Cash in On

SEE HOW WILMOT-OCC HEAVY-MEDIA VESSEL CUTS PRODUCTION COSTS





U.S. & FOR. PATENTS PENDING. THE ORE & CHEMICAL CORP.

The above interior picture of the Wilmot-OCC HM vessel graphically illustrates the unprecedented simplicity it introduces. Check how this design simplicity reduces all costs: capital, operating and maintenance. For example:

① Single rake performs dual functions: keeps medium in suspension, and gravity uniform; removes sink material.
② Only one moving part in vessel.
③ No rotating parts in the medium.
④ No power-transmission trains; unique hydraulic motor is integral with drive shaft.
⑤ Open top and sides permit continuous visual inspection and easy accessibility.
⑥ Vessel readily cleared of sink material with a few extra strokes of blade, permitting quick start-up.
⑦ Only one point of friction in vessel: between rubber-tipped rake and vessel bottom.

Commercial-Size Pilot Plant Test Facilities Are Available

WILMOT ENGINEERING CO. HAZLETON, PA. *Plant:* WHITE HAVEN, PA.

VICTAULIC®

METHOD OF PIPING

VICTAULIC HAS EVERYTHING...

VICTAULIC COUPLINGS
Simple, fast, reliable. Styles 77, 77-D, for standard uses with steel or spiral pipe, — Style 75 for light duty. Other styles for cast iron, plastic and other pipes. Sizes ¾" to 60".

ROUST-A-BOUT COUPLINGS
For plain or beveled end pipe Style 99. Simple, quick, and strong. Best engineered and most useful plain end coupling made — takes a real "bull-dog" grip on the pipe. Sizes 2" to 8".

VICTAULIC SNAP-JOINTS
The new, boltless, speed coupling, Style 78. Hinged into one assembly for fast piping hook-up or disassembly. Hand locks for savings in time and money. Ideal for portable lines. Sizes 1" to 8".

COUPLINGS FOR EVERY PIPING JOB

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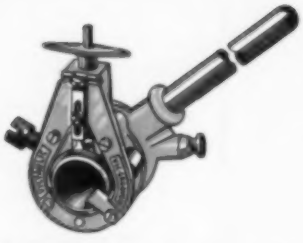
Elbows, Tees, Reducers, Laterals, a complete line—fit all Victaulic Couplings. Easily installed — top efficiency. Sizes ¾" to 12".



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Time saving, on-the-job grooving tools. Light weight, easy to handle — operate manually or from any power drive. Sizes ¾" to 8".

PLUS FITTINGS AND GROOVING TOOLS

"EASIEST WAY TO MAKE ENDS MEET"

Promptly available from distributor stocks coast to coast.
Write for NEW Victaulic Catalog-Manual No. 55

VICTAULIC COMPANY OF AMERICA
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Personal Notes

J. M. Stanley has been promoted to general superintendent of the Sycamore Coal Co., Cinderella, W. Va., according to an announcement by T. C. Hamill, assistant general manager. In the same announcement Mr. Hamill said that **Marvin Harmon** has been promoted from mine foreman to superintendent of the company's Buccaneer Mine and that **Willis Smith** has been promoted from section foreman to mine foreman at Buccaneer. Mr. Stanley will be in direct charge of all mining operations of the Buccaneer Mine, Patterson, Va.; New Cinderella Mine, Hatfield, Ky.; and the Cinderella and Alma Mines, Cinderella, W. Va.

Gene L. Fraley has been appointed assistant to Foster F. Frable, vice president in charge of industrial anthracite sales for Weston Dodson & Co., Inc. Mr. Fraley joined the company in 1947, trained for 3 yr at the Dodson mines and main office in Bethlehem, Pa., then served an apprenticeship in a retail sales capacity. In subsequent years, he became a representative for wholesale distribution of anthracite and bituminous and a district manager of the company's Buffalo-Rochester territory. His new job returns him to Bethlehem.

Kentucky's Governor A. B. Chandler has appointed James Phalan, Earlington, Ky., chief of the Kentucky Department of Mines & Minerals. He succeeds **A. D. Sisk,** who resigned Dec. 13. Mr. Phalan is a former mine inspector and a former mining company safety director.

Hagy R. Houck has been appointed assistant superintendent of Gary No. 2 mine, U. S. Steel Corp. Mr. Houck has been employed at several mines in U. S. Steel's Gary Dist. Before the appointment he was general mine foreman at Gary No. 6.

Ernest V. Bowman, former superintendent of Winding Gulf No. 4 mine, W. Va., has been promoted to general superintendent of Winding Gulf Coals, Inc.

Walter England, a general mine foreman, has been promoted to superintendent of the Killarney mine, Lillybrook Coal, W. Va., Mr. England, a miner for 15 yrs, assumed the new post when the Killarney mine was reopened recently.

Obituaries

Joseph D. Davis, equipment designer, chemist, and retired head of the U. S. Bureau of Mines' Pittsburgh Coal Carbonization Section, died Jan. 20 in Pittsburgh, Pa. He was 73.

Mr. Davis was internationally famous

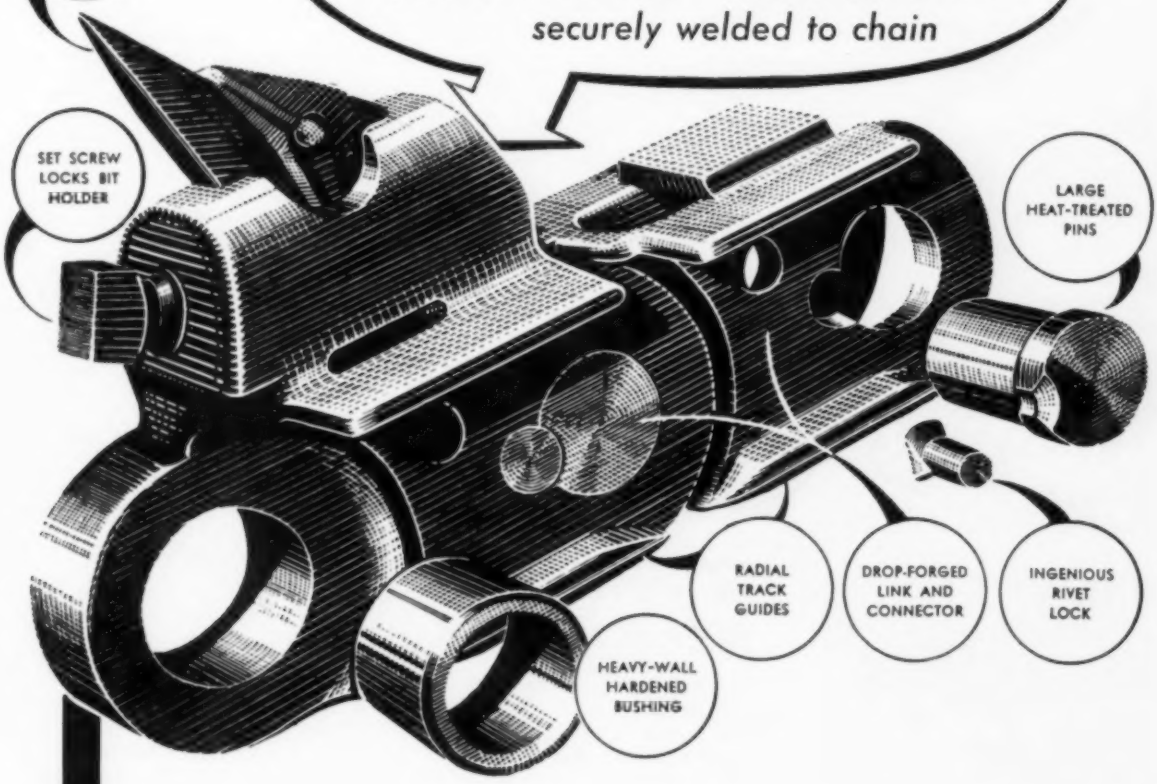
SOMETHING NEW (and better) HAS BEEN WELDED!

BOWDIL BITS

THIS BIT CARRYING BODY.. FORMERLY CAST ALLOY STEEL

NOW DROP-FORGED!

securely welded to chain



MADE BY THE MAKERS OF THE..

..STRONGEST CUTTER BAR IN THE COAL INDUSTRY

...NOW all the wearing parts of the Bowdil Coal Cutter Chain are Drop-Forged!

The **BOWDIL** Company

CANTON 7, OHIO

for the practical techniques he developed in the field of coke-making. In 1950, the Department of Interior formally recognized him for his advances into research by presenting him with its Distinguished Service Award. In 1952, after 32 yr with the Department, he retired.

Mr. Davis entered federal service in 1907 to direct the U. S. Geological Survey's Coal Analysis Laboratory in Washington. He transferred to the USBM in 1910, soon after its establishment, and continued research in coal. At the close of World War I, he journeyed to Switzerland on a special mission to investigate sampling and analytical methods used on coal imported by the Swiss. Returning here, he began a research project in coal-storage problems. Much of the equipment designed by Mr. Davis as a result of his research has been used extensively for years by gas and coke makers and the steel industry.

Lambert K. Williams, 47, a mine superintendent employed by the International Harvester Co., Benham, Ky., died Feb. 3 in Benham hospital after a heart seizure. Mr. Williams had been with the company for more than twenty years.

Charles M. Moderwell, a Chicago coal executive, died Jan. 15 at home in Evanston, Ill. He was 83. Mr. Moderwell entered the coal business in 1891 and in 1904 organized the company which later became the C. M. Moderwell Co. He served as its president until 1923. From 1928 until 1935 Mr. Moderwell was associated with the Chicago, Wilmington & Franklin Coal Co. He was a former president of the Illinois Coal Operators Association.

Bertram Chesleigh Hylton, retired general manager of the Lake Superior Coal Co., Superior, W. Va., died Feb. 16. He was 69. Mr. Hylton became general manager of Lake Superior Coal in 1914. At the time of his retirement he was also general manager of the Cannelton Coal Co. Before his appointment in 1914 he was superintendent of the Tidewater Coal & Coke Co., Vivian, W. Va.

E. E. Jones Jr., Bluefield, W. Va., a former vice-president and general manager of Winding Gulf Collieries, died Feb. 9. Mr. Jones was one of the men credited with the early electrification of coal mining in West Virginia. He was employed first in the industry as an electrician and master mechanic. He was, successively, general superintendent of mines for the E. E. White Coal Co. and general manager of Winding Gulf Collieries. He retired last year.

Association Activities

Wendell W. Brown, assistant manager of the Edna Coal Co., Denver, Colo., has been elected president of the Colorado-New Mexico Coal Operators Association. The association represents the two-state coal industry in all matters except labor negotiations.

MEETINGS

American Power Conference; annual meeting, March 21-23, Sherman Hotel, Chicago, Ill.

Canadian Institute of Mining and Metallurgy; annual meeting, April 9-11, Chateau Frontenac, Quebec City, Que.

Colorado School of Mines; Symposium on Rock Mechanics, April 23-25, Golden, Colo.

American Mining Congress; Coal Convention, May 7-9, Hotel Netherland Plaza, Cincinnati, Ohio.

"Nucleonics" and Armour Research Foundation's Industrial Nuclear Technology Conference; May 15-16, Armour Research Foundation, Chicago, Ill.

Bluefield Coal Show, May 23-25, N&W Terminal, Bluefield, W. Va.

Rocky Mountain Coal Mining Institute; 52d regular meeting, June 17-20, Hotel Colorado, Glenwood Springs, Colo.

National Coal Association; Convention, June 13-14, Shoreham Hotel, Washington, D. C.

At the Trail, British Columbia, Lead and Zinc Mine, owned and operated by The Consolidated Mining and Smelting Co. of Canada, Ltd.

DIFFERENTIAL PRODUCTS INCLUDE

Locomotives, Mine Cars, Mine Supply Cars, Rock Larries, Mantrip Cars, Air Dump Cars, Dumping Devices and Complete Haulage Systems.

WITH THE DIFFERENTIAL ROTARY DUMPER

It's everyday procedure at this Canadian lead and zinc mine. A touch of the air control starts the dumping action and the law of gravity takes over. It's as simple as that!

Simplicity in design, speedy operation, low upkeep, safety, low initial cost and ease of erection . . . these are some of the reasons why you are seeing more and more single and multiple Differential Dumpers in the mining world.

Our engineering service is at your service!

DIFFERENTIAL STEEL CAR COMPANY

FINDLAY, OHIO

SINCE 1915 — PIONEERS IN HAULAGE EQUIPMENT

there's a reason it's not freezin*

1. **FREEZE PROOF**—Coal is easier to sell when it's easier to handle. Permatreated coal resists freezing both in transit and in stock piles. Freeze-proof coal is a customer benefit for industry or home. Take the worry out of winter sales when you sell Permatreated coal—freeze proof, easier to handle.

2. **DUST PROOF — ODORLESS**—Permatreated coal insures dustless deliveries and handling, odorless storage and burning

3. **DECREASE WATER ABSORPTION**—Permatreated coal repels water

4. **REDUCE MOISTURE**—Add 300,000 BTU per ton for each 1% reduction in moisture

5. **AVOID CORROSION**—Non-corrosive Permatreat can't pit or corrode stoker equipment

6. **MAINTAIN QUALITY**—Permatreat reduces deterioration from weathering

7. **ELIMINATE WINDAGE LOSS**—that results in lost weight claims and air pollution complaints

8. **CONTROL BULK DENSITY**—Permatreat insures uniform coke production and quality

* *Coal treated with . . .*

Ashland
PERMATREAT
COAL SPRAY
seals in dust

"lasts the life of the coal"

Interested? Write, wire or phone

ASHLAND OIL & REFINING COMPANY

Ashland, Kentucky

Special Advisory Service available from nationally recognized authorities on coal treatment.

AIME *(from p 134)*

fectiveness of the process.

4. Charging hot coals into the carbonizing furnace increases tar yield and decreases gas yield.

STRUCTURAL CHANGES

Using lantern slides to show structural changes occurring in closely dimensioned cubes of coal, heated at a controlled rate to a temperature of 1,070 F. Mr. Holowaty pointed out that the behavior of the heated coal is influenced by its position relative to the petrographic layers. Greater pressures can be tolerated parallel to petrographic layers than perpendicular to the layers. The tests also indicate that behavior of the various coals may be predictable with regard to swell and the pressures developed on heating. Pocahontas coal, Mr. Holowaty said, provides a weak, pebbly coke in these tests, perhaps indicating why pressure is developed in charges containing Pocahontas coal in the blend.

ESTIMATING SULFUR

Each 0.1% increase in coke sulfur, above the 0.6% generally accepted to blast furnace operators, results in an increase of 40c per ton in the cost of blast furnace operation, Mr. Grace pointed out, in recommending a possible way to arrive at a reasonable estimate of sulfur in coke in the shortest possible time. Studies conducted at Penn State compared sulfur determinations made in the standard Russell oven with those obtained from an oven developed at Penn State and from the ASTM volatile-matter oven. The purpose was to calculate ratios which might be used to convert determinations made in the latter ovens to Russell-oven equivalents. A determination in the Penn State oven, for example, requires 80 min. against 8 hr in the Russell oven. Test results show that acceptable ratios can be worked out, any deviations falling well within allowable tolerances of ASTM specifications for the analysis of coal and coke.

Utilization—Gasification

In analyses of "The Petrographic Composition of Two Alabama Whole Coals Compared to the Composition of Their Size and Density Fractions," Reynold Q. Shotts, professor, fuel engineering, University of Alabama, concluded that:

1. Bright coal, dull coal, and fusain in bituminous coals react with nitric acid at different rates and the bulk of each of the components reacts at a uniform rate.

2. Distinct components do exist. They tend to concentrate, more or less, in different density or size fractions. A "material balance" calculation from size and density fraction analyses shows that the components react essentially the same way toward nitric acid in the fractions as they do in the whole coal.

3. Weighted average reactivity indexes, calculated from whole coal analyses and from analyses of the size or density fractions, checked each other closely and are

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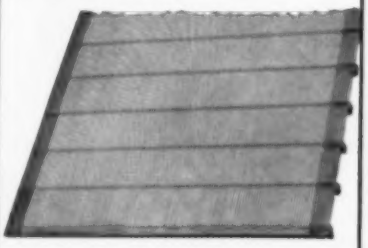

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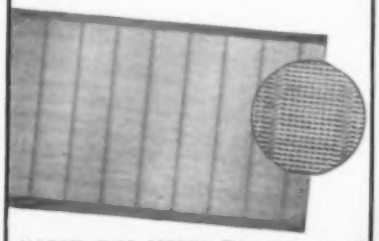

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probably in the same order as the rank of the coals. The coals examined were too nearly the same rank to provide valid evidence on this point.

4. The percent of the more reactive and less reactive components of a bituminous coal can be determined by nitric acid oxidation rate analyses.

RECYCLING RESIDUE

Experimental results have confirmed calculations based on theoretical data that recycling unburned residue will improve the entrainment-type gasification process. The results came out of a study conducted in the Vortex reactor by James Jonakin, William C. Harrold, Charles R. McCann and James W. Myers—all of the USBM.

Mr. Jonakin, presenting data on the study at the Thursday morining session, said that recycling of the unburned residue was simulated by feeding a mixture of coal and residue collected from previous tests.

A series of runs consisting of 24 test periods was made at various oxygen-coal and residue-coal ratios. The results extrapolated to adiabatic conditions indicate that a carbon conversion of nearly 100% can be achieved at a relatively low oxygen-coal ratio by recycling the unburned residue.

HYDROCARBONIZATION

The yields obtained by hydrocarbonization of coal in an expanded bed are higher than those from conventional low temperature carbonization, according to a report made by A. P. Pipilen, R. W. Hiteshue, W. Kawa and W. Budd, all USBM.

Mr. Pipilen, speaking for his associates, cited the following yields from hydrocarbonization: 15% hydrocarbon gases, 20% oils, 50% char, and the balance, carbon dioxide and water. The hydrocarbon gases may be used as high-Btu gas. The asphaltic oil requires further hydrogenation in the vapor phase at 3500 psig to prepare quality fuels.

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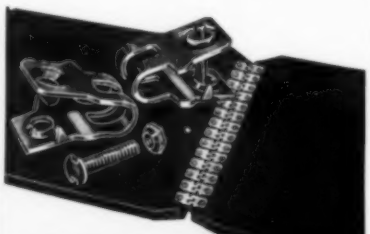

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General Technical

Permanent support of overburden, effect of new iron ore supplies and metallurgy on fuel needs, and vacuum filtering with agent-kerosene emulsions were topics at the Thursday afternoon session. Respective speakers were C. T. Holland, head, department of mining engineering, Virginia Polytechnical Institute, Blacksburg, Va.; E. P. Carman, chemical engineer, Bituminous Coal Research, USBM; and Shiou-Chuan Sun, professor, department of mineral preparation, Pennsylvania State University, University Park, Pa. T. R. Jolley, USBM, and T. R. Spicer, professor, fuel technology, Pennsylvania State University, University Park, Pa., were associate chairmen.

OVERBURDEN SUPPORT

In recent years studies of rock stresses have been made but some of the conclusions have been found to be incorrect.

Citing various theories and the results of laboratory work at VPI, C. T. Holland said that several theories agreed that the stresses vary as the square root of the width. Results of laboratory studies on fine coals have provided some promising data but more information is needed. The floor strata also should be studied.

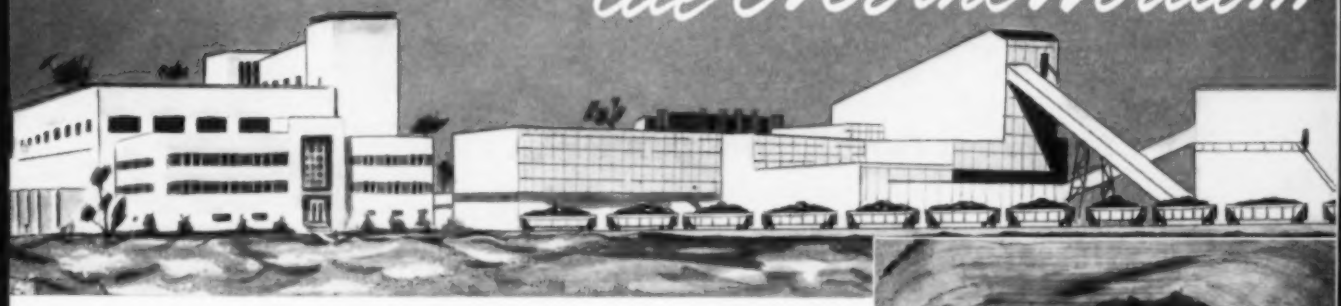
FUELS AND METALLURGY

Developments in iron ore reserves and changing technology pose problems in fuel supplies and technology in metallurgy and fuel research and production, E. P. Carman observed. Changes in iron metallurgy may make possible the use of coke breeze or char in an agglomerating process and result in a reduction of the fuel used per ton of iron. Another possibility is the development of iron coke, which uses a highly expanding coke and taconite directly to form the iron coke. Changes to low-grade ores could result in changes in the fuel pattern. There is enough coking coal in eastern U. S. for 190 yr but new metallurgical processes may come in use in the western part of the country where poorer quality ores and coal must be used.

AGENT-KEROSENE EMULSIONS

Tests were made to determine the relative effectiveness of 48 surface active agent-kerosene emulsions for vacuum filtering anthracite and bituminous coals. Results showed that the best emulsion was made from Tween 81 and kerosene. Actual plant tests at the Rochester & Pittsburgh Coal Co. showed the practical applicability of the emulsion by lowering the moisture of the coal both from the filter and dryer, and reduces the loss of solid in the filtrate, Shiou-Chuan Sun reported.

Modern Mechanized Mines All Over the World...



Interior illustration of highly mechanized operation where Continuous Miners and Cincinnati Chains and Bits are a "Must"!

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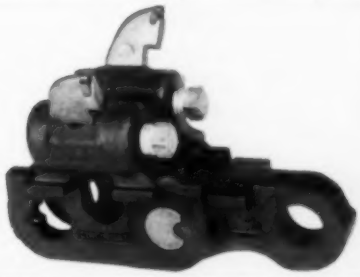

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Always looking ahead, CINCINNATI MINE not only offers a complete line of chains and bits for every type of CONTINUOUS MINING MACHINE in use but has designed chains and bits for new machines now in the development and testing stage. Keeping ahead of the field is nothing new to the men at CINCINNATI MINE who have devoted the greater part of their lifetime to specializing in the design and manufacture of the BEST IN CHAINS AND BITS for every type of machine and for every individual cutting problem. Our leadership is not only the result of our own HIGHLY SKILLED PERSONNEL but also due to the fine cooperation our research staff and field men have had from our many friends in the industry. If at any time you have a cutting problem, we welcome the opportunity to be of assistance.

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After the Great Ford Foundation Gift . . .

What Still Remains To Be Done To Provide Decent Faculty Pay

The Ford Foundation's gift of a half billion dollars to our privately supported colleges, medical schools and hospitals, now being distributed, is magnificent. But it will be much more magnificent if it inspires completion of the job to which it gives a lift. So far as the colleges and universities are concerned, this job is primarily to rescue their faculty members from being second-class citizens economically.

Even in a period when we have become accustomed to astronomical financial figures, a half billion dollars remains an eye-popping gift. In fact, it is so imposing that a good many people who don't read the fine print are apt to conclude that it must just about solve the financial problem to which it is addressed.

Goes Only a Small Way

However, we have allowed college professors to fall so far behind the parade financially that the share of the Ford half billion dollar gift going directly to the improvement of faculty salaries ($210 million) will go only a small way financially toward doing what is necessary to provide adequate salaries.

Completion of this job for our privately supported colleges and universities calls for:

1. An increase in faculty salaries at least five times as great as that made possible by the Ford gift merely to restore salaries to their 1939 purchasing power level and an increase fifteen times as great to provide adequate salaries today.

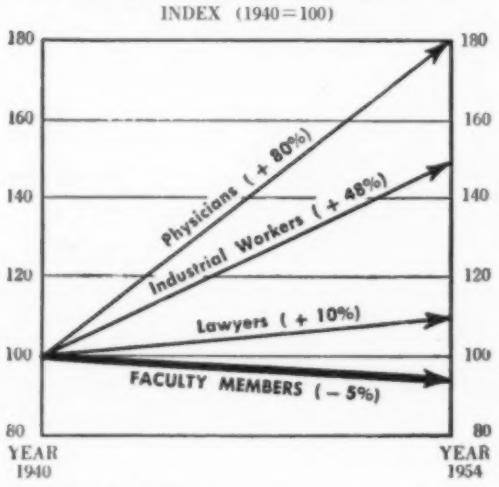
2. Some difficult and courageous decisions by the heads of the colleges and universities in apportioning the grants received by them.

Terms of Gifts to Colleges

The $210 million of the Ford Foundation gift going specifically to improve faculty salaries is being distributed on the following basis: Each of 615 privately supported, regionally accredited liberal arts and science colleges and universities receives a gift about equivalent to its last year's teaching payroll. For ten years only the income from these gifts is to be devoted to raising faculty salaries. After that all the money can be spent in any way the institutions receiving it see fit. There is no requirement that universities having other than liberal arts and science schools limit use of the gifts to improving salaries in these schools alone. They can spread it right through all their faculties if they wish.

In addition to the gift of $210 million specifically directed to increasing faculty salaries, another gift of $50 million goes to a group of 126 institutions selected for specially noteworthy leadership in improving

What's Happened to College Faculty Salaries*



* Real Income before Taxes.

Source: Council for Financial Aid to Education, U. S. Dep't of Commerce; U. S. Dep't of Labor.

the status and pay of teachers. For these schools the individual gifts add about 50% more to the amounts coming from the $210 million fund. They can be used to improve faculty salaries if the institutions choose to do so, but this is not required by the terms of these gifts.

The $210 million plus the $50 million should yield an income of $10-$13 million a year. Even if all this is used to raise salaries, it will be only a small step, however worthy, toward the $200 million per year the colleges need to meet their salary requirements adequately.

Helps Some Who Need It Most

In focussing its gift to improve faculty salaries in privately supported liberal arts and science colleges, the Ford Foundation aims at least part of the help at the spot where it is most desperately needed. Numerous surveys have indicated that the most poorly paid of all college and university faculty members are those in small, privately endowed liberal arts colleges.

But the overshadowing fact is that the teachers in our colleges and universities as a whole are badly underpaid. Just how badly is indicated by the chart above which first appeared in an earlier editorial. (Figures later than those for 1954 are not available.)

The Ford gift will turn the indicator of faculty salaries, which now lies far below the general salary trend, upward a few points. And it will do this in some places where salaries are below the wretched average shown by the chart.

But the Crucial Test Remains

College and university administrators will have the opportunity to extend further the process of getting the help provided by the Ford Foundation gifts where it is most needed. In general, this will mean giving it to senior faculty members, in order to hold experienced teachers and make college teaching attractive as a career. But to make such a division in many schools will take extraordinary fortitude.

The crucial test of the success of the enterprise of the Ford Foundation in raising faculty salaries will lie in whether it prompts the rest of us — college alumni, individuals, business firms and legislators alike — to see that it is a great beginning, not a signal for a recess.

Even with the Ford gifts providing $10-13 million a year, our privately supported colleges and universities must have an increase of about $190 million a year to provide decent faculty salaries.

This is a job far beyond the capacity of the Ford Foundation, imposing though that is. It is a job far beyond the capacities of a few hundred large corporations and a few thousand wealthy individuals. If it is to be done, it is a job at which all of us must work with a will.

This message is one of a series prepared by the McGraw-Hill Department of Economics to help increase public knowledge and understanding of important nationwide developments that are of particular concern to the business and professional community served by our industrial and technical publications.

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—says J. O. ARCHIBALD
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Among the Manufacturers

Dorr-Oliver Inc., Stamford, Conn., has acquired all the business and most of the assets of the Merco Centrifugal Co., San Francisco, Calif., in exchange for 50,000 shares of Dorr-Oliver common stock. Merco Centrifugal manufactures centrifuges, centrifugal screens and strainers. Dorr-Oliver Inc. manufactures specialized machinery and equipment for the treatment of sewage, water and trade wastes. The move was expected by the executives of both companies to help develop new commercial uses and bigger markets for Merco products.

The Pattin Manufacturing Co., Marietta, Ohio, has been purchased by the Eastern Malleable Iron Co., Naugatuck, Conn. Pattin was established in 1888 and manufactures roof bolts. No changes in operating personnel or in established policies are expected according to J. B. Dempsey, president.

The Frank G. Hough Co., Libertyville, Ill., has announced that it will construct a 55,000 sq ft addition to its plant. The company manufactures "Payloader" tractor-shovels. The announcement said that with the addition the company would own the largest plant in the world (368,000 sq ft) manufacturing tractor-shovel equipment. The new facilities, the company said, would provide an area 32 times greater than the original property occupied 16 yrs ago. Hough did not announce constuction costs.

Timken Roller Bearing Co. has established a new office and warehouse in Memphis, Tenn. The company has announced that the facilities will sell the company's complete line of tapered roller bearings to service the replacement trade. R. P. Hall has been named Memphis manager.

The Electric Steel Foundry Co., Portland, Ore., has organized a Central Sales District in Danville, Ill. The district will handle sales of "ESCO" construction, logging and sawmill equipment for buyers east of the Rockies. It will also sell stainless and high alloy products and cast specialties for the central states and areas of the south. Tom P. Kirby, manager of the company's Gulf, Atlantic and Midwest branches, will also manage the new district. D. R. Babbitt will manage the Danville manufacturing plant. Earl Berger, a sales engineer in Pennsylvania's anthracite industry, will assist Mr. Kirby.

Allis-Chalmers Mfg. Co., Milwaukee, Wis., has appointed E. J. Mercer general manager of its Construction Machinery Div. Mr. Mercer has been managing director of the company's subsidiary, Great Britain Ltd., Essendine, England. He joined Allis-Chalmers in 1937, has served in the company's Memphis branch, worked for the War Production Board in Washington and has directed managing operations in Buffalo, N. Y., and in the southwest.

R. G. Gehlsen, former manager of sales engineering at Joy Manufacturing Co., Electrical Connector Div., has joined the Brad Harrison Co., Hillside, Ill., as vice president of engineering.

L. Z Budzen, formerly sales representative in Cleveland, Ohio, for the Carboloy Dept., General Electric Co., has been appointed a specialist of mining sales. Mr. Budzen will make his headquarters in Detroit and will be responsible for carbide mining tool sales involving original equipment manufacturers.

Marshall E. Prunty, formerly associated with Roberts & Schaefer Co., has been appointed district sales manager by Wilmot Engineering Co., White Haven, Pa. Mr. Prunty will direct sales of the company's Coal Preparation Equipment Div., covering the coal areas of West Virginia, Kentucky and Virginia from his office in Huntington, W. Va.

The appointment of Austin L. Hawk as manager of its western sales district (Chicago) **has been announced by Raybestos-Manhattan, Inc.,** Passaic, N. J. Mr. Hawk will supervise the sales of industrial rubber products and mechanical packings by sales staffs at Chicago, Ill., and Denver, Colo.

Allegheny Ludlum Steel Corp., Pittsburgh, Pa., has appointed these distributors to handle mining tools being manufactured by its Carmet Div.: (1) McCombs Supply Co., Jellico, Tenn.; (2) Union Supply Co., Denver, Colo.; (3) Consolidated Supply Co., Picher, Okla.

Russell L. Lepley has been elected a vice president and general manager of the Connellsville Manufacturing & Mine Supply Co., Connellsville, Pa. Paul A. Dorley, former president of the BMC Manufacturing Corp., Binghamton, N. Y., has been elected vice president and secretary-treasurer. Mr. Lepley is the grandson of the firm's founder, Daniel F. Lepley.

Koehring Co., Milwaukee, Wis., has appointed K. R. Chandler service manager. Mr. Chandler succeeds G. N. Nelson who retired after 44 years of service.

Thew Shovel Co., Lorain, Ohio, has appointed Don L. Douglass parts sales manager. The company's parts are han-

More and More Mines Switch to Manitowoc

Teramana Brothers of Steubenville, Ohio load an average 150 tons of coal an hour with a 2½-yd. Manitowoc 3500 Hi-lift shovel at their strip mine in eastern Ohio.

Wherever there's coal you'll find Manitowoc

Near Clintonville, Pa. Reed Coal Company's 5½-yd. Model 4500 dragline backfills overburden. Note absence of restrictive electrical cables for greater mobility.

You're in good company with a Manitowoc for coal mining! Hundreds of these big capacity machines are getting greater tonnage every shift in pits from Alabama to Pennsylvania. Mine operators everywhere have found Manitowoc Hi-lift shovels and long reach draglines the answer to more profitable operation. Here are just a few reasons why more and more mines are turning to Manitowoc for greater production at lower cost.

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POSITIVE STABILITY — Long, wide crawlers and efficient, rugged design of lower works assures a steady base for full capacity shovel and dragline work under all job conditions.

SMOOTH TORQUE CONVERTER POWER — Engine cannot stall or be overloaded. Digging and stripping is more efficient with power balanced to the load.

Have your Manitowoc distributor give you the complete, profitable story. You'll find there's nothing else like mining with a Manitowoc! Manitowoc Engineering Corp., Manitowoc, Wis.

MANITOWOC Speed Crane CRANES 1-5½ YD. 20-100 TON

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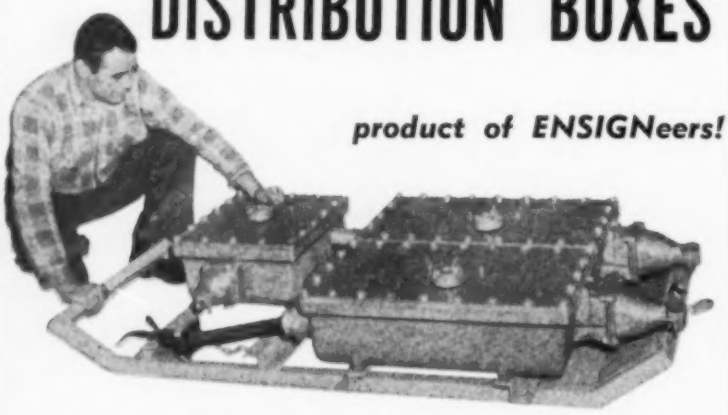

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dled by 144 domestic and 109 world-wide distributors.

Two executives of the American Car and Foundry Div., ACF Industries Inc., have been appointed to supervise and direct sales in the United States. Ellsworth B. Carpenter, vice president of sales, will direct operations in the east and John E. Angst, another sales vice president, will direct ACF's operations in the west.

Three distributors of Syntron vibratory equipment have announced these appointments and changes: Syntron Pittsburgh Sales Co. has appointed Robert Wettling to its sales staff. Mr. Wettling will handle resale accounts in Allegheny and Beaver Counties, Pa. Syntron Boston Sales Co. has hired Edward F. Pierson and Syntron's Central Pennsylvania Sales Co. has moved from Indiana, Pa., to Bellefonte, Pa. Frank Belleteri will sell Syntron equipment in the Bellefonte territory and James Meehan will cover the Johnstown, Pa., area.

L. L. Brooks, formerly with Worthington Corp., Washington, D. C., and Carroll & Edwards Co., Cincinnati, Ohio, has joined the Baldwin-Lima-Hamilton Corp., Construction Equipment Div., Lima, Ohio, as a sales representative. Mr. Brooks will sell the company's shovels, cranes and draglines through the West Virginia Mine & Supply Co., Clarksburg; West Virginia Machinery, Inc., Charleston; and the Pittsburgh and Harrisburg, Pa., offices of the Highway Equipment Co.

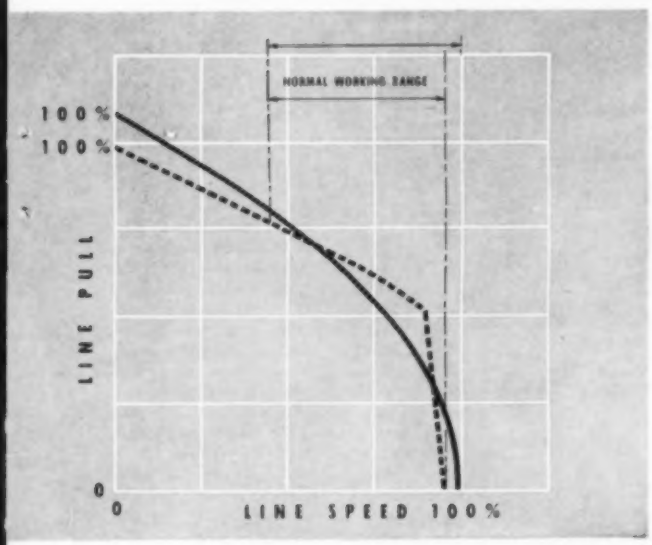
Machinery & Supplies Co., Inc., Kansas City, Mo., has been appointed by the Marion Power Shovel Co., Marion, Ohio, to distribute rubber and crawler mounted excavators in Kansas and the western third of Missouri.

Two divisional sales manager appointments have been announced by the Marion Power Shovel Co., Marion, Ohio. George L. Moritz has been named manager of the company's eastern sales area with headquarters at Emmaus, Pa. Lawrence E. Schaffer has been named manager of the company's central sales area with headquarters in Columbus, Ohio.

One of the middle west's oldest companies (123 yr), the Austin Powder Co., Cleveland, Ohio, has begun selling Ramset powder-actuated tools and fasteners to the coal mining industry. The tools and fasteners are made by Ramset Fastening System, a part of the Olin Mathieson Chemical Corp. Austin has 50 distributors situated in 11 midwestern, eastern and southern states.

George A. Naab has been appointed manager of the Pneumatic & Electric Equipment Co. (PEECO), Philadelphia, Pa. He succeeds P. F. Smith, who resigned to join Schramm, Inc., West Chester, Pa., as dealer sales manager.

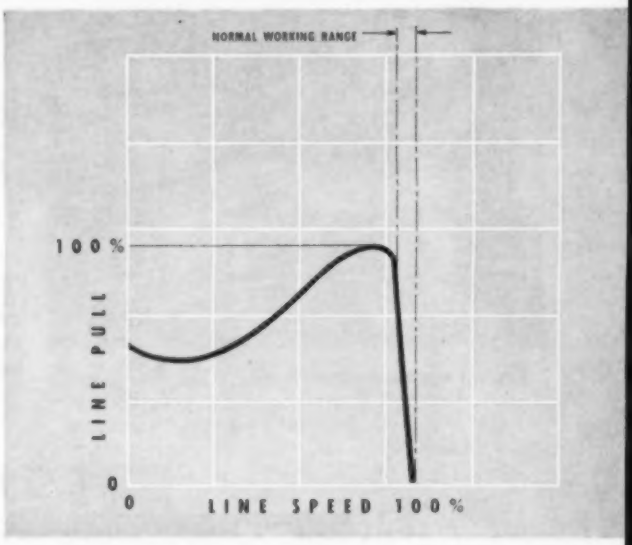
LIMA teams A.C. electric motor with torque converter for power-on-demand through wide operating range



Power Performance of LIMA'S New Optional Unit:

A.C. Electric motor with torque converter drive. (Diesel-torque converter curve (dotted line) shown for comparison.)

With this drive, even under extreme loading, the motor will pull down in speed only a very small amount. It can never be stalled. The line pull will constantly increase through a long pull down speed range, depending upon the load applied.



Power Performance of A.C. Electric Motor with Direct Drive:

The motor speed and torque vary as shown for line speed and pull

With a pull down in speed of only 3% to 5%, torque rises too fast. The motor will stall quickly after peak torque is reached. Workable speed range is small, stalls are frequent.

Lower First Cost — Reduced Maintenance

Now another quality-extra is available on all Lima machines. It's Lima's new electric power unit designed to give you full power-on-demand through a wide operating range.

Combining a single A.C. motor with a single stage torque converter, this drive matches, *electrically*, diesel-torque converter performance. It powers all motions and permits application of full power to any one motion as required. Under extreme loading, required power output is supplied at constant motor speed . . . and the motor can't stall or burn out.

The simplified electrical setup—with single A.C. motor and no complicated electrical controls—means lower first cost. Electrical maintenance is reduced to a minimum, and servicing does not require highly trained personnel.

Just check the performance curves above. You'll quickly see that Lima's quality-built electric power unit provides the ideal answer for *your* jobs calling for electrically powered machines. You'll get maximum power performance under all operating conditions. Get full details now from your nearby Lima distributor . . . or write Construction Equipment Division, Baldwin-Lima-Hamilton Corporation, Lima, Ohio.

CAPACITIES

Shovels ½ yd. to 6 yds. Cranes to 110 tons. Draglines variable. Smaller capacities available on rubber.

Baldwin-Lima-Hamilton Corporation Construction Equipment Division also manufactures Austin-Western Crushing, Washing and Screening Plants at its Lima, Ohio plant . . . and Madsen Asphalt Mixing Plants and equipment at its La Mirada, California, plant.

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Most widely used communication for underground haulage.

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Finest communication between control points in cleaning plants.

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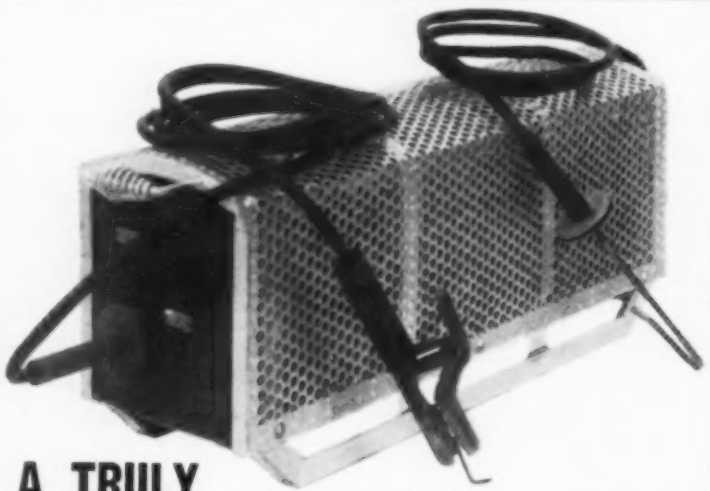
Save time and money by remote control of pumps, fans, sub-stations, etc.

Femco systems were first in the mines and are today first in quality and dependability.
Get the facts. Submit your problem for a proposal.



A TRULY PORTABLE BOND WELDER

Is easy to handle even in low coal. Thin design permits easy removal from cars. A sturdy, dependable unit that can be quickly and easily hauled to the job and put to work immediately.

Quick change taps provide proper welding current for all requirements.

Put an end to your welding problems with a GUYAN Portable Bond Welder.

Full descriptive bulletins available . . . Write for yours

GUYAN MACHINERY CO., Logan, W. Va.

News Roundup *(from p 120)*

that their "black diamonds" will once again become important.

Kaiser Div. To Build 100,000 Kw Steam Plant

The St. Joseph Lead Co. has awarded a contract to the Kaiser Engineers Div., Henry J. Kaiser Co., to design and construct a $16,000,000 steam power plant in Josephtown, Pa. The plant will be situated on the site of St. Joseph's zinc smelting plant on the Ohio River and will have a capacity of 100,000 kilowatts with provisions for expansion. Kaiser said in an announcement last month that the plant was scheduled to begin operating in about two years.

The basic units of the plant will include two 50,000 kw turbo-generators, supporting facilities such as steam generators, coal handling facilities, transmission lines and a water pumping plant.

St. Joseph Lead Co. mines and smelts lead and zinc. Its headquarters are in New York, but its mills are scattered (Argentina, United States, Canada). The company is also developing oil and natural gas resources in Montana and Texas.

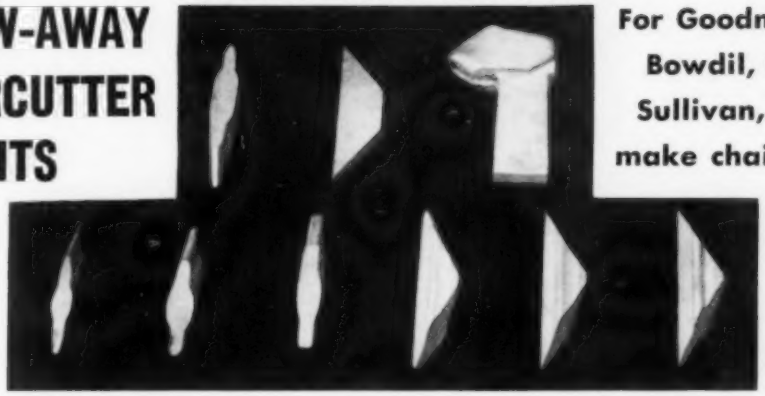
News Briefs

Last year the state of Colorado produced 3,400,000 tons of coal, a boost of 450,000 tons over 1954. Last month a Colorado state legislator, Rep. A. Woody Hewett, a Republican, predicted that Colorado some day may become "the fuel bin" of the nation. This glowing projection of the west's coal industry was tied to two things, one a fact, the other a look into the future. Rep. Hewett, after noting that coal deposits in the Rocky Mountain area carried a 2,000 year reserve of bituminous, forecast the arrival of an entire industry to liquefy coal and ship it by pipeline. The Colorado legislator submitted his optimistic outlook to the Colorado state legislature in a report of the Interim Synthetic Fuels Committee. Mr. Hewett believes that if the process of liquefying coal (in particular the Parry process) and transporting it through pipelines becomes successful, Colorado could find itself in the position of providing fuel to the entire nation.

U. S. Steel Corp. last month was reported surveying 11 western states with the objective of locating a multi-million dollar coal tar distillation plant at its Geneva (Utah) Works. The steel-making company would not go beyond a simple announcement that the survey was being made. Reportedly, however, the plant is expected to cost "millions" and is expected to be an addition and expansion of present light oils production from coke oven gas. Observers say it will be several months before the results of the survey can be assessed. The same observers say

KERFMASTER

THROW-AWAY UNDERCUTTER BITS



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The renewable cutter Rock Bit for Strip Mines, Quarries, and Geological Surveys

Bearings can be lubricated. **Cutters can be replaced.**

Bit body can be re-used many times.

Worn out cutters after drilling 5400′ of rock and earth overburden.

Same bit body with used cutters removed.

Installing new cutters in same bit body. No loss of diameter.

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Central Mine Equipment Company

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Controlled Quality

CARBIDE MINING TOOLS

for greater production economy

the drill ...
with the twist that counts

Longer-wearing NP Controlled Quality Carbides combined, by the exclusive Newcomer "strain-free" brazing process, with a tough, strong, alloy tool steel drill body ... twisted to provide free-cutting, non-clogging drilling!

With its expanded mining operation, Newcomer Products, Inc. features a full line of NP Controlled Quality Carbide drill bits, roof drill bits and machine bits ... from start to finish, every carbide tool is quality controlled in our own modern plant.

Newcomer Products, Inc.
LATROBE, PENNSYLVANIA

For the name of your nearest Newcomer Representative contact: General Sales Office, 512 Franklin Ave., Pittsburgh 21, Pa.

the survey and the possible contruction of a new tar distillation plant are increasing evidence that "steel" is getting into chemicals. Traditionally, the steel industry has been a supplier of certain low materials considered "by-products" of coke reduction and has not entered the field as refiners and formulators of complex chemical compounds made from coal and coal gases.

Rep. John P. Saylor (R-Pa.) said last month he plans to introduce a resolution in Congress that would authorize a study leading to establishment of a research and development program for the coal industry. Rep. Saylor said that he will ask the House of Representatives "to look into the possibility of arranging a research program for coal in the same magnitude" as the programs being conducted by the Atomic Energy Commission, the National Advisory Committee for Aeronautics and similar groups. The Congressman said he was "particularly eager" to determine the practicability of constructing a large-scale synthetic fuels plant for development of techniques that would permit commercial production of gaseous and liquid fuels.

Nashville Coal Co. Inc. was last month incorporated to do business in Paducah, Ky. The $11,000,000 mining and river transport company is a subsidiary of West Kentucky Coal Co., Madisonville, Ky. The incorporation action was reportedly one of the largest in Kentucky in several years. Earlier in the month Nashville Coal bought three Great Lakes barges from the Buckeye Steamship Co. Fleet, Cleveland, Ohio. The sale was disclosed by Hutchinson & Co., Great Lakes barge operators, who said the three vessels would be operated on the lakes until October. Each barge has about an 8,000 ton capacity.

Dr. Milton H. Fies, engineer, coal technologist and vice president in charge of operations of the Alabama Power Co., was awarded the Department of Interior Conservation Service Award last month. Dr. Fies was presented with the award for his contributions in the last ten years to studies of underground coal gasification experiments. The experiments were conducted by the Bureau of Mines in Gorgas, Ala.

A battery of infra-red ray lamps was used last month to thaw coal frozen to the sides of railroad cars. The lamps were set up on Lakefront Docks in Toledo, Ohio, where 12 of them successfully thawed frozen coal in half the time needed under present systems (steam, blow torch, gas and oil burners). Perfection Industries, which has been licensed by German patent holders, furnished the bank of heaters for the Toledo dock tryout.

A Pennsylvania County Board of Assessors (Luzerne County) last month turned down the plea of the Glen Alden Corp. to reduce coal assessments $12,068,907 over a 10 yr period. Glen Alden had asked for the reduction on coal classified as not mineable for a period of 35

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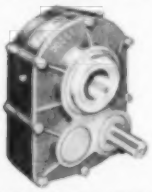

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Dodge Bulletins you should have-

- ☒ Flexidyne Dry Fluid Drives and Couplings. Complete story and selection data. Bulletin A-640-A.
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Write for your copies.

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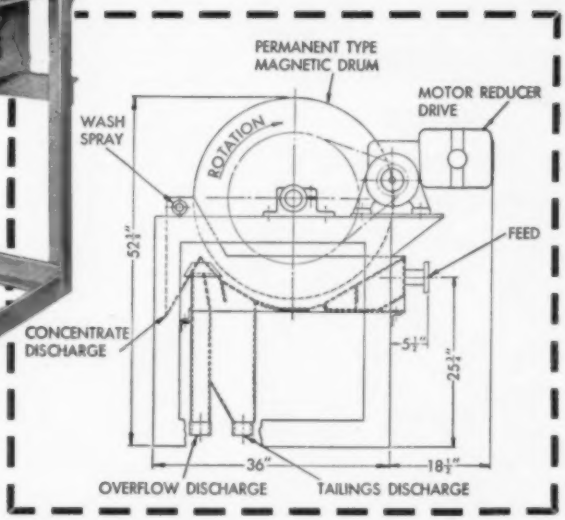

STEARNS ANNOUNCES

new wet-drum magnetic separator for heavy media plants

Here is the Stearns type WPD Model M magnetic separator — a powerful, new wet-drum permanent magnet unit designed for efficient recovery of media in heavy density plants.

Specially-designed magnet not only has a deep, powerful field, but also provides correct flux distribution for positive transport of the collected magnetics to the discharge point. Both of these factors mean highly efficient magnetic recovery for the type WPD separator.

Designed to give you high recovery of magnetic media at low cost

Low Operating Cost — Powerful Alnico permanent magnet requires no external energization — eliminates cost of rectifier or motor generator set.

Power requirements for driving drum are low because drum turns on anti-friction bearings — yet plenty of power is available when heavy load occurs.

Non-magnetic drive components do not attract magnetic particles, thus reducing wear on chains and sprockets.

Steady Material Flow — Minimum Drum Wear — Separator tank and feeder is designed to distribute feed uniformly across the entire drum width at a point where maximum media recovery is assured. Concurrent feed keeps wear and abrasion on cylinder to a minimum and improves purity of magnetic concentrate.

Concurrent Feed Eliminates Wipers and Wash Spray — Feed flows in same direction as drum rotation, so any carry-over on drum is re-introduced to magnetic field. Wash sprays or wipers are optional if diluted concentrate is desired.

Utmost Simplicity in Operation and Maintenance — One man can control a number of units. Separator is easy to assemble and disassemble, requires a minimum of floor space.

High Gravity Concentrate — Magnet assembly squeezes out excess water and discharges concentrate with a solids content in excess of 60 percent in most installations.

Write for complete details on this new efficient type WPD heavy media separator.

1151

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• REMA is not just another cold patch. REMA is vulcanization by chemical process. The repaired area is sealed with an abrasive resistant cover stock patch. No heat or heavy vulcanizing equipment required. Here's the astonishing advantage—*when repair work is completed belts may be returned to service immediately.*

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• Used for repair of all types of damaged spots, edge wear and for covering metallic joints. Available in introductory kits or parts separately.

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REMA SELF-VULCANIZING
RUBBER REPAIR MATERIALS

yr. For the first year, the company asked an assessment reduction of $1,235,274 (1956), but instead was granted a cut of $245,635 by the Pennsylvania assessors.

The Renton Coal Co., Library, Pa., owned jointly by Pittsburgh-Consolidation Coal and National Steel Corp., is activating two more sections in its mine at Renton, Pa. By adding two more continuous miners, the company will have a total of six operating in Renton by the end of the year.

A coal washer in Corbin, Ky., owned by the United States Steel Corp., Lynch, Ky., will be completed April 1 after more than a year's construction, the company has announced. The washer will clean coal for shipment to Gary, Ind.; Lorain, Ohio, and Chicago district steel plants.

W. Roy Cunningham, a former mine inspector for the seventh bituminous district, has been appointed to administer the new Underground Gas Storage and Well-Drilling Act. The Act became effective Jan. 30.

Miners at six Island Creek Coal Co. mines in Mingo County, W. Va., ended a 3-day walkout last month after an agreement had been reached for review of their grievances. Some 1,800 men struck after the starting time of five electricians had been changed in a Red Jacket mine and after a miner had been discharged.

A series of tests aimed at finding out whether nuclear heat can be used to produce gas from coal have begun at the Appalachian Experiment Station, Bureau of Mines, Morgantown, W. Va. The tests do not yet involve nuclear heat.

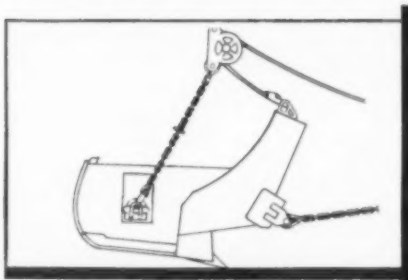
COAL MEN ON THE JOB . . .

C. H. MEAD COAL CO.—No. 3 mine, East Gulf, Raleigh County, W. Va.—Buel Stoneman (left), section foreman; Roscoe Jessup, operator of Wilcox Miner; Levi Hornsby and William Miller, helpers.

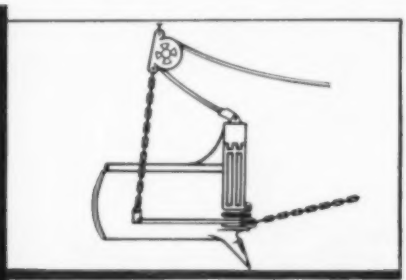
CONSOLIDATION COAL CO.—Mine 93, Jordan, Marion County, W. Va.—Burton Farence (left), assistant mine foreman; Ted Rundle, general mine foreman; Walter O'Dell, maintenance foreman; and K. K. Kincell, superintendent.

...Here's Why Page AUTOMATICS Outperform Ordinary Buckets...

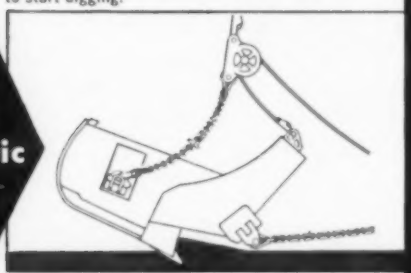
Page Automatic Bucket Action



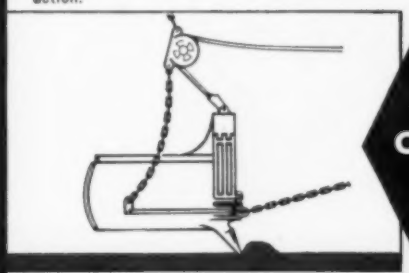
STARTING FROM FLAT POSITION, automatic is ready for pull — no need to drop it on its teeth to start digging.



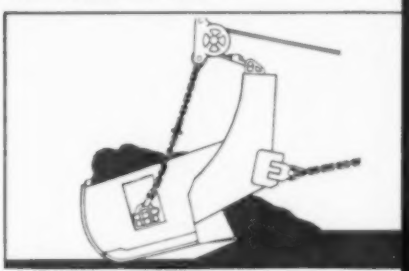
Ordinary bucket's weight is evenly distributed . . . depends on sharp angle of teeth to begin digging action.



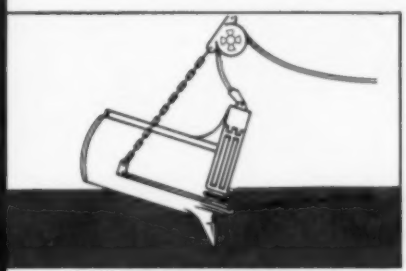
FIRST PULL ON LOAD LINE automatically shifts full weight of Page Bucket to the teeth and bucket begins digging immediately.



Bucket is dragged until teeth catch or snag on soft ground or projection before digging in.



CONTINUED PULLING LOADS BUCKET — weight of load shifts center of balance to the rear, causing the bucket to come up **automatically** as it finishes loading. Completely filled in 1 or 2 lengths, bucket is ready for fast hoist and dump.



Sharp angle of teeth and flat balance of ordinary bucket cause it to keep digging in as pull is continued. Bucket must be jockeyed and pulled loose from ground before hoisting.

This is how Ordinary Buckets Work

AUTOMATIC'S DIGGING ABILITY PAYS OFF IN GREATER PRODUCTION

The test of a dragline bucket's value to you is the yardage it can handle in a given time. Page Automatic Buckets *will produce more yardage per rated capacity than any other bucket.* Let us give you a demonstration. We will put the right Page Automatic on your machine and prove that it will increase production by as much as 10 to 25%.

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Automatic Dragline Buckets

Walking Draglines

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Foreign News *(from p. 122)*

liance on its collieries as fuel sources. Dr. Schumaker painted a bleak picture of Britain's fuel outlook. In addition to not having much hope for the coal industry, he said Britain could not depend on oil imports for fuel at the present rate of economic expansion. He also termed atomic energy "still a laboratory stunt" and skeptically crossed it off as a "newcomer that has not yet arrived."

Mechanization in British coal pits moved to a new high last year when the British power-loaded 30,000,000 tons, according to the National Coal Board. The British hope to power-load at least 30,000,000 tons this year and eventually raise that figure to 50% of all the coal being mined in the United Kingdom. Reports indicate that this might be reached by the mid-1960's.

Recent output reports show that thus far in 1956 the British are running about 200,000 tons behind last year. Deep mining output has fallen 337,000 tons, but this has been partly offset by a rise of 142,000 tons in open pit operations.

The British imported about 635,000 tons of coal in January against 607,000 a year ago.

Great Britain's new minister of fuel and power, Aubrey Jones, has called for a substantial increase of capital investment in Britain's coal industry. He reports that investment in the British coal industry is only half the rate of investment in the French coal industry. One segment of the British coal industry, he declares, has increased output to a record high and that a large factor in the increased output was a high rate of capital investment. He was referring to the East Midlands Division, which mined 46,000,000 tons last year.

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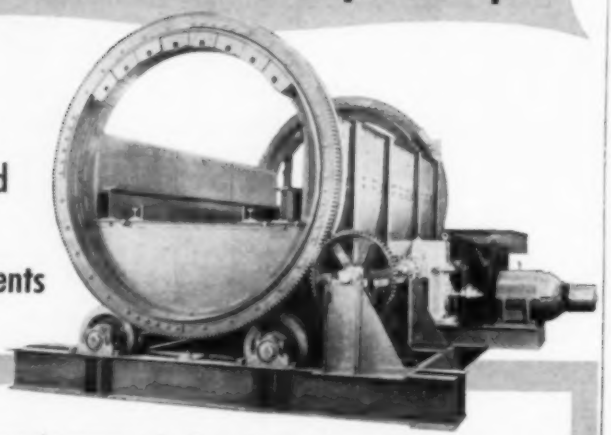
Custom designed to requirements



Here are the reasons why Connellsville Rotary Dumps are your assurance of long-term, low cost operation . . .

- Rugged construction and ample power for low maintenance and long life.
- Machine cut gear rings and pinions provide drive from both ends on trunnions with anti-friction bearings without play and slippage . . . eliminates car twisting in frame.
- Cars automatically power-locked in position and held secure while dumping, supplemented with our own engineered car haul.
- Coupled or uncoupled cars are dumped in a 10 second operation.
- One man lever or push-button control for complete operation, assuring perfect rail alignment.

Plan now to economically speed up your dumping operations . . . specify Connellsville Rotary Dumps.

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Books for Coal Men

Fuel Technology

Fuel, by J. S. S. Brame and J. G. King. This revised edition includes fundamental information on the properties of coal, oil and gas and up to date information on their uses. Chapters also are devoted to fuel analysis and fuel efficiency. *551 pp. 6x9 in; cloth. $10, St. Martin's Press, Inc., 103 Park Ave., New York 17, N. Y.*

Hydraulics

Hydraulic Institute Standards is the latest revision of the standards developed by the Hydraulic Institute. A new loose-leaf binding permits insertion of revised pages as they are issued. Thus it can be kept up to date. Technical details on pumps are divided into sections on centrifugal, rotary and reciprocating units. A two-part data section deals with the problem of pipe friction and pump-construction materials. *188 pp. 10x11⅝-in; loose-leaf binder. $4.75 domestic, $5.25 foreign, Hydraulic Institute, 122 E. 42nd St., New York 17, N. Y.*

Accident Prevention

Accident Prevention Manual is a new and greatly expanded edition of this work by the National Safety Council. Designed as a basic text for safety men, the book includes all the information needed to organize a safety program. There are 43 sections covering every aspect of industrial accident prevention. *1341 pp. Cloth. $13.50, National Safety Council, 725 N. Michigan Ave., Chicago 11, Ill.*

Other Books and Booklets

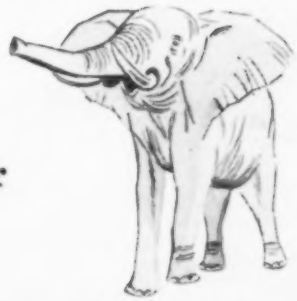
Prevention of Accidents in the Use of Explosives is a new, revised list of instructions and warnings on the proper handling and use of explosives and blasting supplies. *4 pp. 9⅝x11⅝-in; paper. Free, Technical Division, Atlas Powder Co., Wilmington 99, Del.*

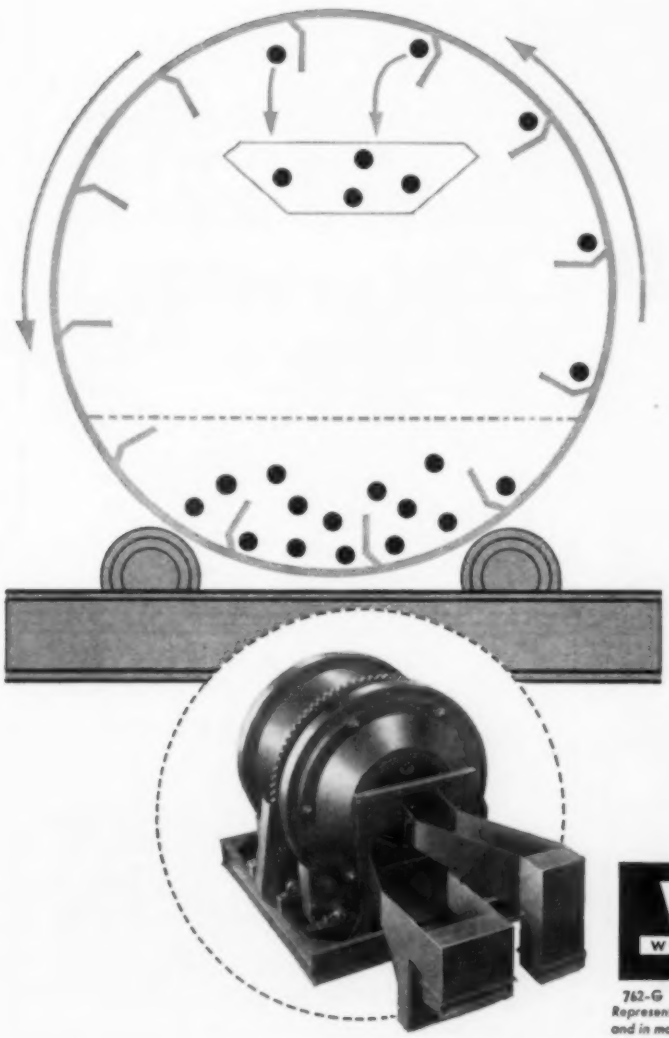
Fractional Carbonization of Wyoming Noncoking Coals, by Edward Prostel and Neal Rice describes a laboratory method for carbonizing suitable coals progressively and analyzing tar yields and gas quantities recoverable in several fractions with increasing carbonization temperature. *6 pp. reprint from Industrial & Engineering Chemistry, Nov., 1955. Available from Natural Resources Research Institute, University of Wyoming, Laramie, Wyo.*

see for yourself

WHY THE WEMCO HMS DRUM DOESN'T WEAR OUT

Operators have observed that a Wemco HMS Drum Separator has a long long life.





The difference between this separator and others (that wear in a hurry) is that the entire Wemco Drum rotates as a unit. There are no moving parts inside – no chains, sprockets, screens, scrapers or sweeps to wear due to the extremely abrasive action of rock and medium. The lifters are a built-in part. In them the sink material stays in place until it drops out at top center. And even if the drum is shut-down fully loaded, there are no jamming or abrasion problems on start-up.

The common sense in this drum design is another example of Wemco's sound solution to mining industry problems. This Drum has become the most widely used of all HMS separatory vessels. It has helped, too, to make Wemco's HMS Mobil-Mill the world's most popular Heavy Media plant. Over 50% of all HMS plants use Wemco equipment. Write today and let us send you all the facts.

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Model 51-55 Dual
COAL DRILL

TWO DRILLS IN ONE

"It's a life saver to us"
says W. V. Hartman, Supt. Victoria Coal Corp.

Working ahead of an 8-yard loading shovel in 4-ft. coal, speed is essential.

Traction, hydraulic and electrical system operated by 109 hp engine. Push button controls. Drills can be operated singly or in tandem.

CUTTINGS SHIELD and GUIDE

—completely automatic

Blast holes, as seen in the picture, are kept clean from cuttings dropping back down the hole. A dam is formed about each blast hole excluding casual surface water.

•

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CONTRACT CORE DRILLING

EXPLORATION FOR MINERAL DEPOSITS
INCLUDING URANIUM & LIMESTONE — ANYWHERE

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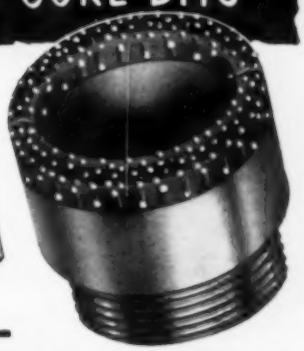

● Mining contractors, ore prospectors, coal operators and construction firms are realizing tremendous savings by taking advantage of our **exclusive fabrication service!** Contractors send us the necessary diamond stones from their own stocks—we hand set them in a super-hard tungsten carbide crown and braze to the threaded steel blank. Hand-set bits assure the proper positioning of each diamond stone to achieve maximum cutting efficiency. The carbide matrix holds the diamond stones until entirely used up. These advantages mean lower drilling costs to you. We can also supply complete core bits or salvage the stones from used bits at nominal cost. Supplied in standard sizes EX, EXE, AX, BX, NX, etc.

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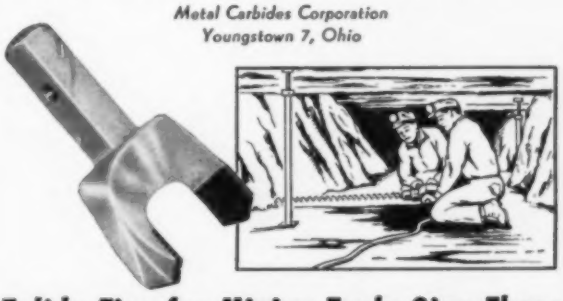

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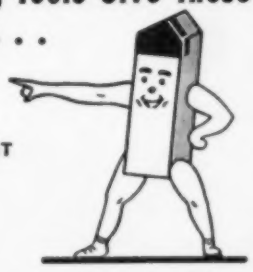

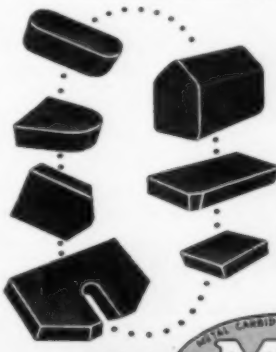

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2—5-SC Joy Shuttle Cars
5—6-SC-5AE Joy Shuttle Cars
5—Jeffrey 29-U Cutting Machines, late type, permissible
3—300 KW G.E. Rotary Converters, Type HCC-6, Form P, 1200, 250/275 V, complete with switchboards, switchgear, 1600 amp. I-T-E automatic reclosing breakers
3—200 KW G.E. Syn. Rotary Converters, Type HCC-6, Form P, 1200, 250/275 V, switchboards and all necessary switchgear including 1200 amp. I-T-E breakers.
Above converters all equipped with three single phase, 60 cycle transformers, 2300/4000 V AC.
3—300 KW Westinghouse M.G. Sets, 250/275 V, 3 phase, 60 cycle, 2300 V, 1200 speed, complete with switchboards and all necessary switchgear.
2—200 KW G.E. M.G. Sets, 250/275 V, 1200, 2300 V AC, complete with all necessary switchgear
1—500 KW Westinghouse M.G. Set, 250/275 V DC, 1200 RPM, 3 phase, 60 cycle, 2300 V, complete with all necessary switchgear

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4—20-ton Westinghouse Tandem Locomotives, each consists of two 10-ton Locomotives, Type 927-LD, 250 V, hydraulic brakes, dynamic braking, sanders, contactor controls, equalizers, new in 1950. Like new now.
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2—20-ton Jeffrey MH-77, 250 V, complete with air brakes, sanders, contactor controls, equalizers. Now 42" gauge. Very late type. Will change to any gauge.
5—15-ton Jeffrey MH-77
3—10-ton Jeffrey MH-143
4—15-ton Jeffrey MH-110
10—8-ton Jeffrey MH-100
Completely rebuilt by efficient electricians and mechanics with years of experience.

All type Loading and Cutting Machines, Shuttle Cars, Rotary Dump and Drop Bottom steel Mine Cars, all gauges, Single and Double Drum Hoists for all purposes, with 100 to 1200 HP motors.

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1—Goodman Cat truck, 220 volts, AC.
7—Joy T1-3PE Cat trucks, 250 volts, DC.

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1—30" Belt conveyor 150 ft. long, complete with Dings Magnetic head pulley, 15 HP 220 volt AC motor and speed reducer. New type Jeffrey ball bearing idlers.
1—18" Flight conveyor 152 ft. centers, flights 18" x 6" x ¼".

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Approx. 7500 ft. 3/con., 2/0, 5000 volt trenchlay cable as good as new, wrapped on reels, 300-500 ft. long.
Several 1000 ft. reels of 3/con., 2/0 armored lead covered 2300 volt cable.
2100 ft. New 300,000 CM lead covered, armored single conductor cable.

CRUSHERS
1—30 x 48 McNally Pittsburg double roll.
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2—36 x 36 Jeffrey single roll crushers.
2—18 x 18 McNally Pittsburg double roll stoker crushers.
1—20 x 24 McNally Pittsburg single roll.
1—24 x 48 McNally Pittsburg double roll crusher newest type, only used approx. 30 days, good as new with steel base and V belt drive.
1—Type AC-3A American Pulverizer crusher.

DRILLS
1—580 Dooley DC drill, single arm, mounted on rubber tire carriage, like new.

DIESEL ENGINES
1—Brand new 60 HP International Type UD14A. Priced attractively.

FANS
1—5' Jeffrey Aerodyne Fan.
1—4' Jeffrey booster fan, ball bearing.
1—7' Joy Fan, type H-111-36, like brand new.

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1—14BU-3PE Joy Loader, 250 volts DC, permissible.
1—8BU Joy Loader, 220 volts AC permissible.
4—8BU Joy Loaders, 250 volts, DC.

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4—15 ton MH77 Jeffrey ball bearing armature locomotives, 42" gauge, one with hydraulic brakes, late type, as good as new. Dimensions length 16'8", width 5'4½", wheelbase 6'4", height 42". Heavy duty equipment making locomotive weigh approx. 17 ton.
1—10 ton MH143 Jeffrey locomotive, complete with ball bearing journals and armatures, #7575, 42" gauge. Overall height 34", length 14'2", width 61", wheelbase 64".
2—10 ton General Electric, ball bearing, 48" gauge.
2—8 ton Jeffrey, ball bearing journals and motors, 48" gauge, type MH78.
25—6 ton MH88 Jeffrey, ball bearing, 43" gauge.
1—8 ton Goodman type 91K42-54T, 42" gauge, 27" high, new in 1950, used only 6 months.
12—6 ton Mancha Battery locomotives, 42" gauge, 42" high overall. Sold with or without batteries. All Electric Locomotives 250 volts, DC.

MAGNETIC PULLEY
1—36" Stearns Magnetic Pulley.

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2—512 EJ Goodman, 250 volts, DC, 8½' cutter bars, with or without bugdusters.
1—512 EJH Goodman, 250 volts, DC, 8½' cutter bar with hydraulic jacks and bugduster, complete with Joy T1 Cat truck.
4—7B-1 Sullivan, 250 volts, DC, 8½' cutter bars, complete with bugdusters, permissible with Joy T1 Cat trucks.

MOTOR GENERATOR SETS
1—200 KW Ridgeway, 2300 volts, AC, 250 volts, DC, 900 RPM.
1—200 KW Allis Chalmers, 2300 volts, AC, 275 volts, DC, 1200 RPM.
2—200 KW Burke, 2300 volt AC generator, direct connected to 300 HP Imperial Diesel Engines.
1—300 KW Ridgeway, 2300 volts, AC, end, 275 volts DC end, complete with switchboard as good as new.
2—200 KW General Electric sets, 1200 RPM, 2300 volts AC end, 250/275 volts, DC end, complete with automatic circuit breaker, late type.
1—200 KW Westinghouse set, 900 RPM, 2300 volts, AC end, and 250 volts, DC end.
2—150 KW General Electric sets, 2300 volts, AC end, 250/275 volts, DC end, 1200 RPM.
5—150 KW Westinghouse sets, 1200 RPM, 2300 volts, AC end, 250/275 volts, DC end.

ROCK DUSTERS
3—MBA Type S rock dusters, 20 HP, DC motors, 230 volts, 42" gauge track.

ROTARY CONVERTERS
2—300 KW Allis Chalmers Rotary Converters, volts 185, amps 600, 6 phase, 60 cycle, 1200 RPM, DC, volts 250, amps 1200, complete with manual starting equipment and transformers as good as new, tested by a large electrical shop.
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1—Joy T-1 Standard Cat Truck.
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8—Goodman type 33, 6 ton, 44" and 48" Gauge.
2—Goodman 8 ton, type 32A, 44" and 48" Gauge.
3—Westinghouse, type 902, 4 ton.
2—Westinghouse, type 904, 6 ton.
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3—Gasoline and Diesel Locomotives, 4 to 10 tons.

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2—Goodman 224 Slabbers.
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8—Jeffrey 35B's and 35BB's.
2—Jeffrey 29B's on track.
1—Jeffrey 29L, track mounted.
2—Jeffrey 29C's, track mounted.

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9—Joy Loaders, all types.
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3—Goodman 360 Loaders.
4—Myers Whaley No. 3 Automat Loaders.
4—Clarkson Loaders, 26" above rail.

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3—100KW, G. E. TCC-6's, 275 volt, Rotary Converters.
1—150KW, G. E. HCC-6's, 275 volt, Rotary Converters.
1—200KW, G. E. HCC-6 Rotary Converter, 275 DC.
3—300KW, G. E. HCC-6 Rotary Converter, 275 DC.
1—300 KW Westinghouse Rotary Converter, 275 DC.
1—500KW Westinghouse Rotary Converter, 275 DC.
(All the above with 6900/13000 and-or 2300/4000 primary transformers)
1—200KW Westinghouse portable Rectifier.
2—150 KW MG sets, G. E. and Westinghouse.
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1—500KW MG Set, General Electric.
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Complete steam plant, will sell all or any part.
Boilers, like new, 1100 H. P., 500 H. P. Transformers. Turbines, etc.
Complete Tipples with Cleaning Plants.

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1—MSA hi pressure on rubber.
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1—Canton Distributor low pressure.

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10 Air Compressors, 1 H. P. to 40 H. P.
1—Portable Self Propelled Compressor on rubber tires, 30" high.
40 Mine Pumps, all types.
Pipe, plastic, steel transite, all sizes 1" to 6".
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300 Mine Cars, End Dump, 20" high, 48" gauge.
15—Brown Fayro NKL and HGD Car Spotters.
1—12 ton Differential Slate Larry.
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1—Kanawha Hillside Dump.
1—16 Yd. Dragline Bucket.
5—Low Vein Water Cars.
3—3000 Gal. Tanks, like new.
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1—Jeffrey 20 HP box car loader
2—Red Devil portable loaders, 12" x 15"
1—Card portable loader, 11' x 19"

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1—Card Rotary car dumper, 13'x15' platform

ELECTRIC HOISTS

1—11 HP Vulcan, single drum
1—20 HP Vulcan, single drum
1—22 HP Vulcan, double drum
1—25 HP Vulcan, single drum
1—30 HP Vulcan, single drum
1—37 HP single drum
2—50 HP single drum
2—60 HP single drum
4—100 HP Box single drum
1—112 HP Vulcan, single drum
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1—11BU Joy loader, 250V, D.C.
3—5 BU Joy loaders, 230V, D.C.
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1—61HG Jeffrey chain conveyor, 90'
1—61W Jeffrey chain conveyor, 200'
9—G-20 Goodman shakers
6—G-15 Goodman shakers
8—Vulcan shakers
2—UN-17 Joy LaDel shakers
10—Goodman HA duckbills

MINING MACHINES

A.C.

1—7B Sullivan super shortwall
10—Sullivan CE7
1—28A Jeffrey
5—112A Goodman

D.C.

3—7B Sullivan super shortwall
2—T-1 Joy crawler type trucks

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3—100 ton Fairbanks railroad scales
1—125 ton Howe railroad scales

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91—107 cu. ft. Watt steel, end dump, 42" ga.

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3—Joy model 60D3P, battery operated
7—Joy model 60D1, battery operated

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1—120" Joy La-Del axial flow fan, model L-14
1—8H Jeffrey 42" aerodyne fan
1—7' Jeffrey aerodyne 2 stage fan
1—4600 cfm Claridge blower, 3 HP

BATTERY LOCOMOTIVES

1—4 ton Westinghouse, 24" ga.
1—4 ton Ironton, 36" ga.
2—5 ton General Electric, 36" ga.
2—7 ton General Electric, 36" ga.
3—8 ton Ironton, 36" ga.
3—8 ton General Electric, 36" ga.
3—8 ton Goodman, 36" ga.
1—10 ton Atlas, 36" ga.

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1—4½ T. Goodman, 36" ga.
1—5 T. Jeffrey, 36" ga.
1—6 T. Goodman, 36" ga.
1—6 T. Goodman, 42" ga.
2—8 T. Goodman, 42" ga.
3—10 T. Jeffrey, 42" ga.
1—13 T. Goodman, 42" ga.
1—13 T. Jeffrey, 42" ga.
3—15 T. Jeffrey, 42" ga.

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1—8.2 KW G. E. 150/182 V., 15 HP motor, 440V, AC
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1—11.5 KW West., 125 V., 17.5 HP, 440 V AC motor
1—15 KW Elec. Prod. 132 V., 30 HP motor, 440 V AC
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1—M.S.A. type A, 440 V. AC motor
1—M.S.A. #S-1103, 20 HP 230 V. DC motor

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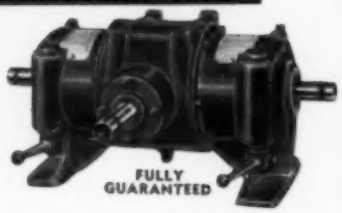

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85 ton Locomotive Mfd. by *Whitcomb Locomotive Co.* in '29, rebuilt in '40. Powered by 2 supercharged Buda Mod. 6 DH 1879 6 cyl. engines, developing 325 HP ea. Has 100 gal. fuel oil tank & 100 gal. water tank. Min. radius curvature, standard 30°, 2 Westinghse. generators, 38" dia. wheels 4½" wide.

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Machines listed below inactive & stored in htd. warehouse since 1945.

30 ton Browning, 50' boom, all steel cab, steam powered, coal burning — 2 single sheaves, 24" dia. for 1" cable, built in '43.

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1 Jeffrey 29-U Cutter 1 Jeffrey L-500 Loader both track mounted 42" gauge used less than two years.

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(C) 4—12BU 9E as is or rebuilt
(C) 2—8BU as is or rebuilt, 500 volt
(C) 3—8BU as is or rebuilt, 250 volt
(C) 3—8BU 110, 220/440 volt AC
(C) 6—58C Joy Shuttle Cars
(C) 2—32E7 Joy Shuttle Cars
(W) 10—32D Joy Battery Cars—Complete
(C) 1—Lee Norse Shuttle Car
(W) 1—T2-5PG, 220 440 volt AC Cat Trunk
(C) 1—Goodman 665 Cat Mounted Loader
(C) 1—Goodman 360 Rubber Mounted Loader
(C) 1—1224 Goodman Cutter, Rubber Mounted
(C) 1—T1 Joy Cut Truck
(C) 2—Late type Goodman Shuttle Cars, 42" high
(W) 6—32E16 Shuttle Cars
(C) 1—Kersey Model 444 Mine Tractor
(W) 2—T2S, 250 Volt DC Cat Trucks
(W) 1—14BU Joy Loader, (38J Head Motors)

CONVEYORS

(W) 2—95A Goodman Belt Conveyors, 24" wide approximately 1000' centers, complete less belt
(W) 3—61AM Jeffrey Room Conveyors
(W) 2—61HG Jeffrey Face Conveyors
(W) 4—G15 Goodman Shaker Conveyors
(W) 4—G12½ Goodman Shaker Drives
(W) 1—PT12 Long Piggyback
(W) 2—15" Joy Chain Conveyors
(C) 5—15" Long Chain Conveyors with 15, 25 & 30 h.p. drives
(W) 1—40 h.p. Robbins 30" belt conveyor 1700' center to center
(C) 10—61EW Jeffrey Elevator 220 V AC
(W) 1—Joy Model C, 30", 750' Belt Line
(W) 1—MTB Joy 30", 1250' Belt Line
(W) 3—MTB Joy 30", 500' Belt Line
(W) 2000'—26" MTB Structure alone

CUTTING MACHINES

(C) 1—1224 Goodman Rubber Mounted
(C) 1—824 Goodman, 42" t.g.
(W) 4—512 DA Goodmans

6—ACME AIR COMPRESORS. 83 R, Model 168
40 h.p. Comp. Motor. 1150 RPM Permissible
Capacity: 176 C.F.M. @ 100#
Compressor Speed: 960 R.P.M.
Overall width—80"
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Overall height—39½"
Ground Clearance: 6"
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Cable Reel—Westinghouse YR 10 P
Weight Each—10,300#
Water cooled—3 wheels—Rubber mounted
63 64" Gauge center to center

(C&W) 2—12AA Standard Goodman
(C&W) 5—12AB Standard Goodman, 35 h.p.
(W) 6—212 AA Baby Goodman
(C) 3—112G3, 220/440 Volt AC Goodmans
(C) 2—312 220/440 Volt AC Goodmans
(C) 1—172 Goodman
(C&W) 20—35B Jeffrey, 35 h.p.
(W) 4—35L Jeffrey 50 h.p., Permissible
(C&W) 4—35BB Jeffrey, 50 h.p.
(C&W) 4—7AU Sullivans
(C) 4—11B Sullivans
(W) 2—7B Sullivans 220 440 volt
(C&W) 12—Sets trucks for 12AA, 212AA & 35B machines

LOCOMOTIVES & MINE CARS

(C) 1—MH100 Jeffrey 42" t.g.
(W) 2—MH100 Jeffrey 36" t.g.
(W) 2—MH96 Jeffrey, 4 ton, 36" t.g.
(C) 2—MH110 Jeffrey 42" t.g.
(W) 5—HM 823 GE 42" tg.
(W) 1—HM 822" GE 42" t.g.
(W) 2—HM 803 GE 42" t.g.
(W) 1—HM 803 GE 36" t.g.
(C&W) 3—3314T Goodman, 6 ton, 42" t.g.
(W) 1—8 ton Goodman, 36" t.g.
(W) 1—13 ton Goodman, 36" t.g.
(C) 1—Vulcan Diesel Locomotive—Rebuilt
(W) 85—44" t.g., end dump, wood mine cars
(W) 75—ACF Drop Bottom, 48" t.g.—nearly new
(W) 85—44" t.g. end dump cars
(W) 50—36" t.g. ACF Drop Bottom
(W) 45—36" t.g. Sanford Day Drop Bottom
(W) 1—Battery Locomotive, 42 t.g.—New

TIPPLE EQUIPMENT

(W) 1—5' Morrow Shaker Screen
(C&W) 4—2 ton Boom Hoist, AC
(C) 1—42" Loading Boom
(C) 1—48" Loading Boom
(W) 1—36" Loading Boom
(W) 1—48" Loading Boom
(W) 1—20 h.p. Railroad Car Puller AC
(W) 1—18" x 25' Belt Conveyor
(W) 1—18" x 42' Belt Conveyor
(W) 1—18" x 75' Belt Conveyor
(W) 1—16" x 100' Belt Conveyor
(W) 1—30" x 200' Belt Conveyor
(W) 1—34" x 30' Belt Conveyor
(W) 6—Drag Conveyors of various sizes and lengths
(W) 600'—36" Belting
(W) 6—Jeffrey Coal Crusher, sizes 24x24, 30x30, 36x36, and 30x45

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(W) 1—200KW West. Rotary 2300/4000Y
(W) 1—150KW GE Rotary 2300/4000Y
(C) 1—200KW MG Set
(W) 1—150KW MG Set
(W) 48—Transformers 5KVA to 50 KVA
(C&W) 12—Single Drum Hoist—10, 15, 20, 25, 35, 40, 50, 100, and 150 h.p.
(C) 1—Nolan Car Spotter
(W) 1—Set Fairbanks automatic track scales.
(C) 150—Ton 40 & 56 lb. relay rail
(W) 4—HKL Brown Fayro Hoist
(W) 3—572CP Coal Drills
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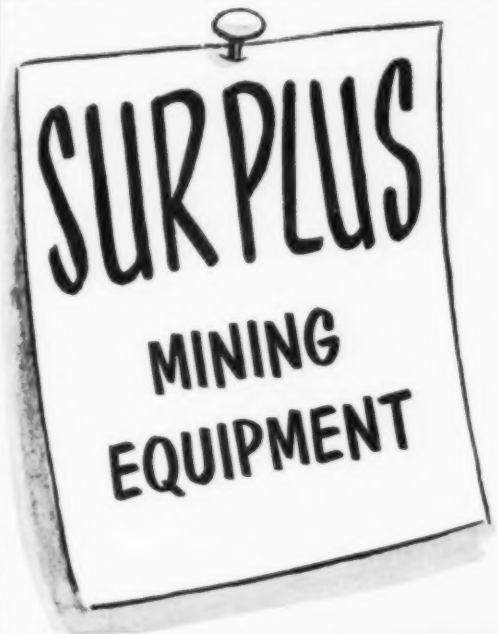

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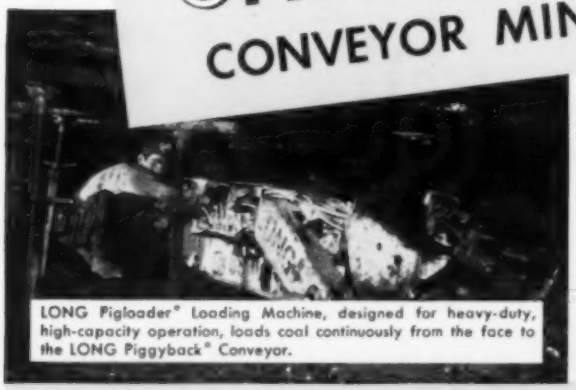
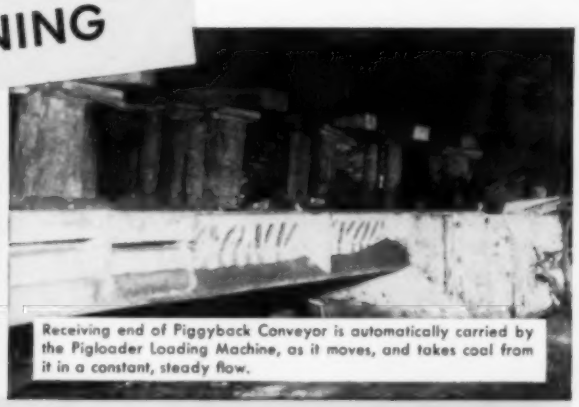
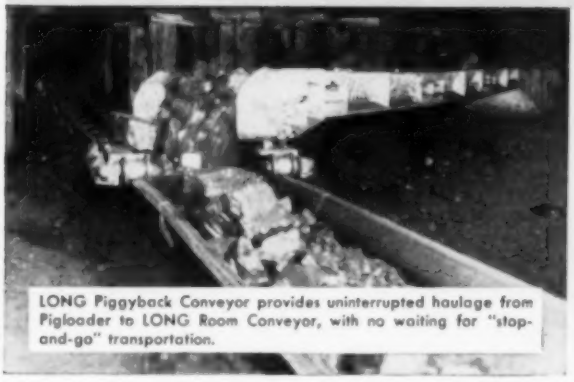


LONG Pigloader* Loading Machine, designed for heavy-duty, high-capacity operation, loads coal continuously from the face to the LONG Piggyback* Conveyor.

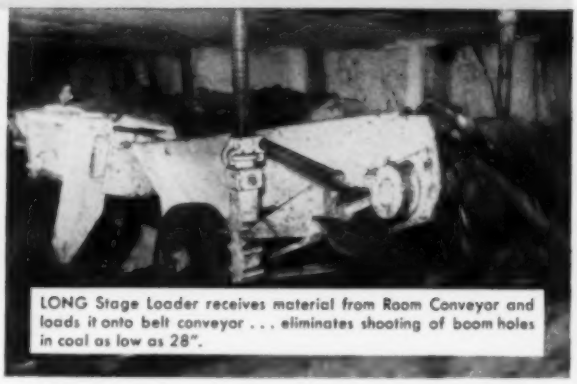


Receiving end of Piggyback Conveyor is automatically carried by the Pigloader Loading Machine, as it moves, and takes coal from it in a constant, steady flow.

Production boosted from 12 to 42 TPM with LONG Continuous-Haulage System



LONG Piggyback Conveyor provides uninterrupted haulage from Pigloader to LONG Room Conveyor, with no waiting for "stop-and-go" transportation.



LONG Stage Loader receives material from Room Conveyor and loads it onto belt conveyor . . . eliminates shooting of boom holes in coal as low as 28".

At this Kentucky mine, a six-man crew, utilizing the LONG Piggyback System in 36″-42″ coal, is consistently producing 42 tons per man-shift (conveyor moves included). Prior to the installation of LONG equipment, production at this operation averaged out to only 12 tpm!

Results like these are typical with Piggyback Conveyor Mining. That's because this exclusive LONG development makes possible continuous transportation from the face to the outside. There are no delays whatsoever for car or buggy changes. In fact, with low-investment, low-maintenance Piggyback Continuous Haulage Mining, six hours or more loading time per shift is not unusual. If you would like more information on today's fastest growing method of mining, write us.

For details or a demonstration, write us today!

*Trade Marks

The LONG Company
OAK HILL, W. VA.

Developers and exclusive manufacturers of the Piggyback Conveyor System—America's fastest growing method of mining.

THE NEW D9...

"MOST POWERFUL AND EFFICIENT TRACTOR I'VE EVER OWNED"

Roberts Coal Co. of Gallup, N. M., bought this CAT* D9 Tractor when a big tractor of another make had too much down time and not enough power to get the work done. And the job is a real tractor-testing one: stripping 20 ft. of alternating sandstone and clay overburden from a 6-ft. flat blanket of coal, and 'dozing approximately 200 ft., to dump in the canyon.

According to Earl Roberts, company owner, his D9 seems made for the job. "It's the most powerful and efficient tractor I've ever owned. And I've found that Caterpillar-built equipment is more dependable and has much less down time than any other," he says.

Performance of this Caterpillar D9 Tractor, which works 14 hours a day, is more than sufficient to keep pace with the daily production of the second largest coal mine in the state. The No. 9S Bulldozer can handle over 9 cu. yd. per pass. And the 286 HP Caterpillar Diesel Engine—first Turbocharged engine on any track-type tractor—is ample to match the D9's weight, traction and blade capacity.

The Caterpillar D9 Tractor is available with torque converter or direct drive with oil clutch to match your job. It has traditional Caterpillar toughness for a long work life with little down time. And it has small-tractor handling ease, with features like "in-seat" starting, hydraulically boosted steering, master clutch and brakes, and smooth "live-shaft" drive for cable controls.

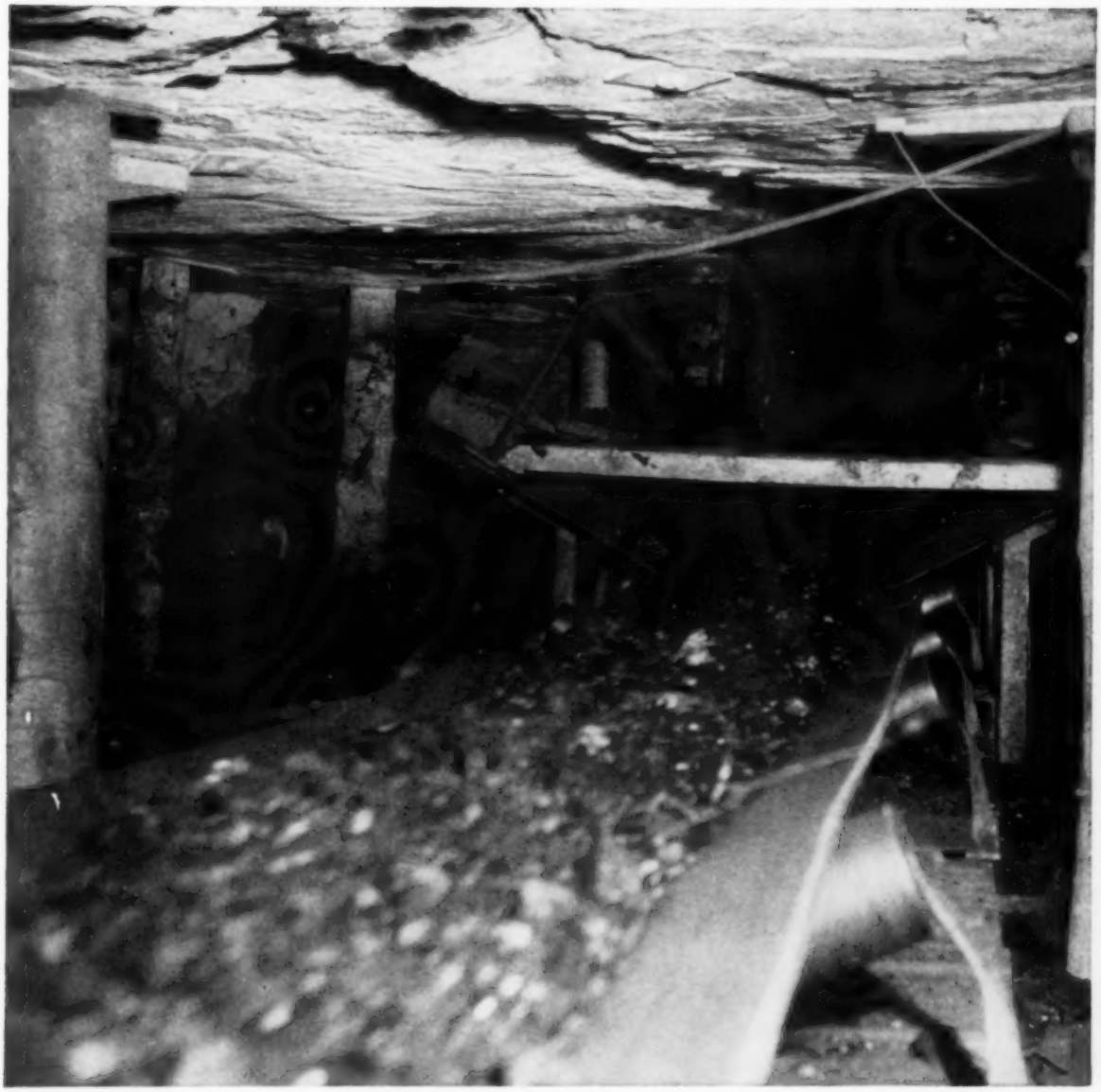
Your Caterpillar Dealer will give you all the facts on the new D9. And you can rely on him for prompt, skilled service and parts you can trust. See him soon.

Caterpillar Tractor Co., Peoria, Illinois, U. S. A.

CATERPILLAR*

*Caterpillar and Cat are Registered Trademarks of Caterpillar Tractor Co.

NAME THE DATE... YOUR DEALER WILL DEMONSTRATE



NEOPRENE BELTS CUT OPERATING COSTS because only neoprene conveyor covers offer the *balanced* resistance to chipping, cutting, abrasion, heat, weathering, grease and oil needed for long, trouble-free performance. With neoprene, you get low operating and maintenance cost performance *plus* an important extra—mine safety, since neoprene does not propagate flame. That's why it pays to *specify neoprene*—the same tough, safe material used for jacketing *all* mine-trailing cable.

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The rubber made by Du Pont since 1932

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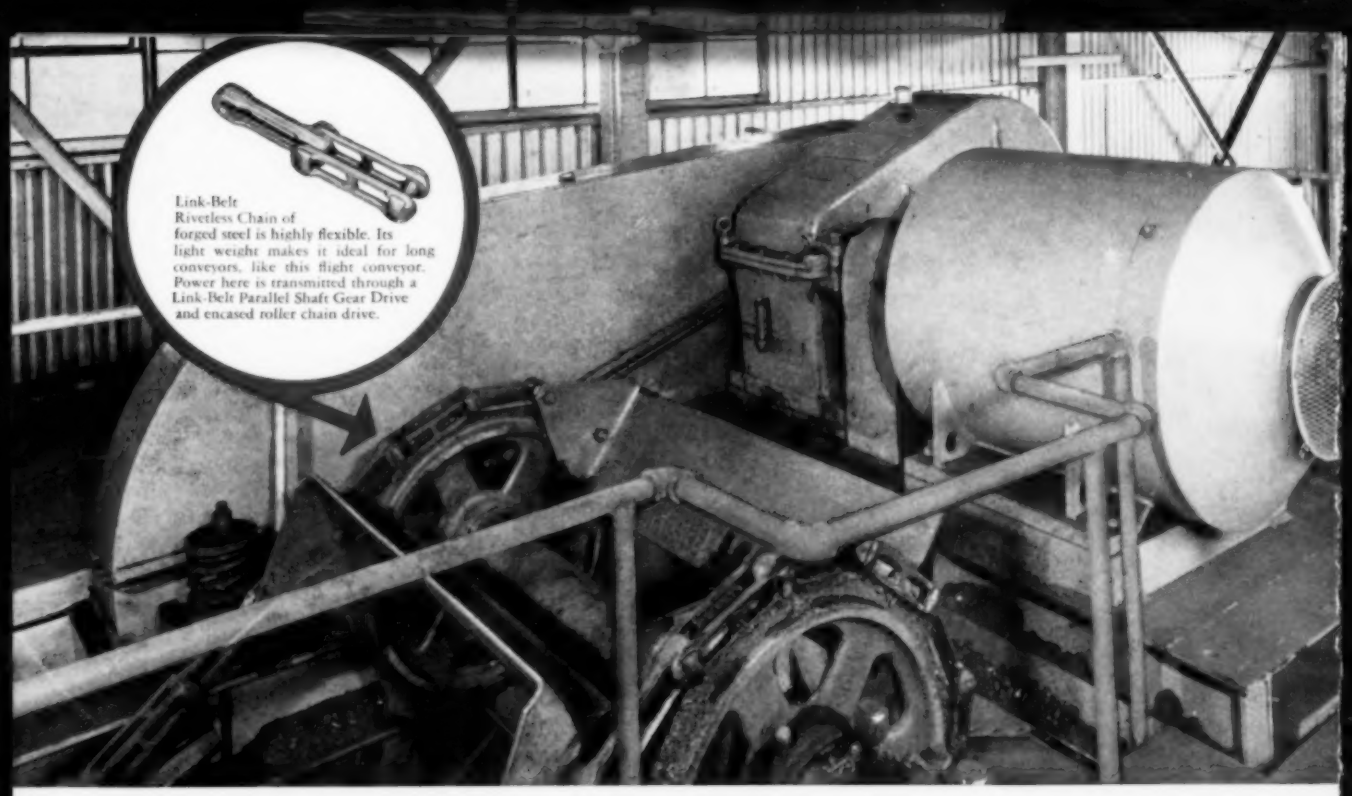

Link-Belt Rivetless Chain of forged steel is highly flexible. Its light weight makes it ideal for long conveyors, like this flight conveyor. Power here is transmitted through a Link-Belt Parallel Shaft Gear Drive and encased roller chain drive.

SIMPLICITY *plus* HIGH STRENGTH

makes Link-Belt Rivetless Chain RIGHT for coal handling

Here's proof that it pays to choose from the complete Link-Belt Line

This is a typical example of chain design that cuts conveying costs. The simplicity of Link-Belt Rivetless Chain permits dismantling by hand, *without tools,* to alter chain lengths or make replacements. And although it has the light weight desired for normal service, it also offers the high strength needed to meet sudden impacts and heavy overloads. It can be furnished heat-treated if desired.

Engineering refinements are the rule in every Link-Belt drive and conveying chain. And breadth of selection further assures the *best* answer for every requirement. In fact, no other single source can match the broad range of Link-Belt roller and silent chain . . . of cast, combination, forged and fabricated steel chains.

You can get all the facts on Link-Belt chain from your nearby Link-Belt office or authorized stock-carrying distributor. Put in a call today.

Other Link-Belt chains and sprockets for conveyors and drives.

LINK-BELT

CHAINS AND SPROCKETS

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